at both sides. A very good feed table is illustrated in Fig. 45 showing the pen of prize winning Galloway steers at the Calgary Spring Fat Stock Show. A 12 foot trough gives 24 feet feeding room, and would accommodate under 'full feed' 100 head of cattle. A feeding trough with small hopper in centre is illustrated in Figs. 39 and 40. This plan prevents the high winds, when the trough is exposed, from blowing the meal away and also helps to prevent waste by the cattle.

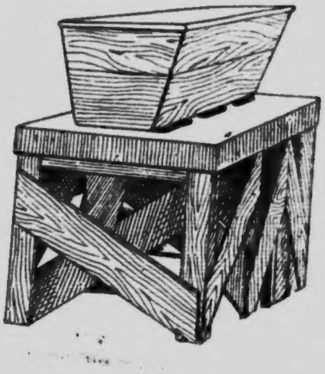


Fig. 39.—Feeding Trough with Hopper. (End view.)

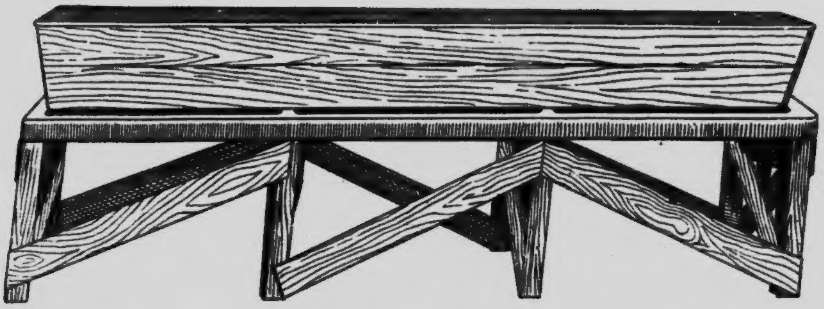


Fig. 40.—Feeding Trough with Hopper. (Side view.)

Contract Feeding.

There are always a large number of mature cattle that from bad wintering, or poor pasturage, are too thin to ship in the fall. The culls from the large droves handled by the big dealers are frequently winter fed on hay or grain, under their own management, but sometimes they are leased out in smaller bunches for winter keep and finishing. Contracts are sometimes made on one or other of the following plans:—

1. To run mature cattle through the winter on hay or straw, $6 per head.

2. To run mature cattle through the winter, giving all the hay they will eat, $12 per head.

3. For grain feeding, 1 cent per pound for the fall weight, and an additional 4 cents per pound for the gain between fall and spring weights. That is, if the steer weighs in the fall 1,200 pounds, and gains 200 pounds, the feeder would get $12 for feeding and $8 for the increase in weight, or $20 for 100 feeding days, which is the stipulated time under such contracts.

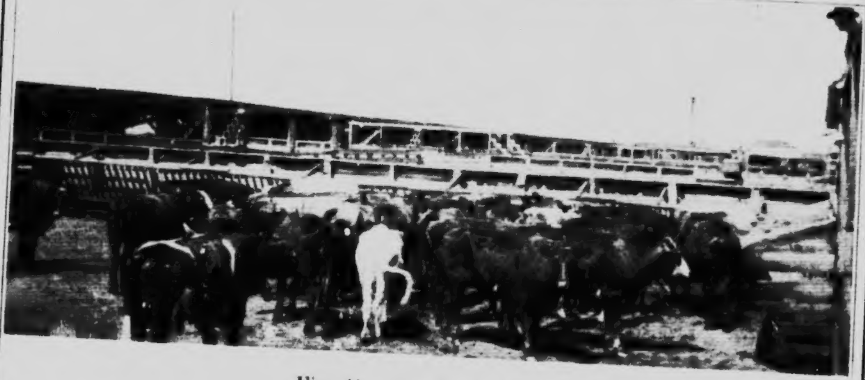


Fig. 41. A carload of culls

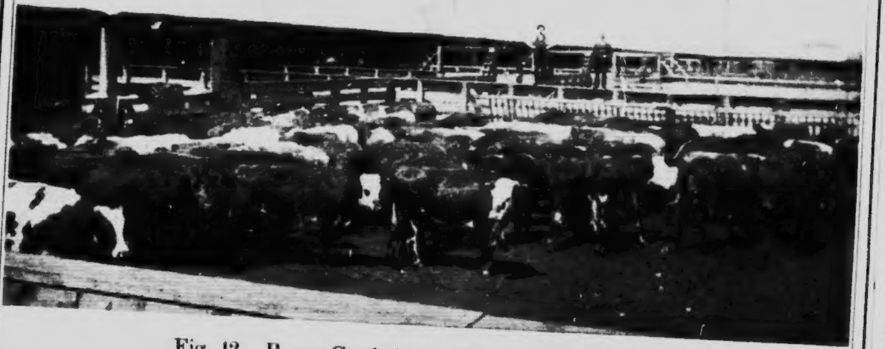


Fig. 42. Range Cattle in the Winnipeg Stock Yards.

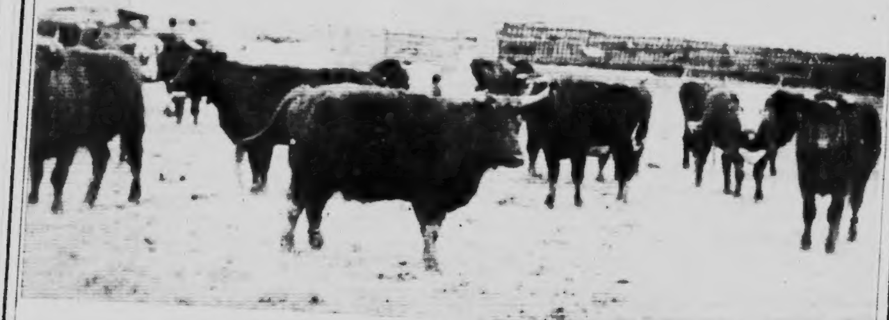


Fig. 43. Group of Spayed Heifers, High River, Alta.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
BRANCH OF THE LIVE STOCK COMMISSIONER

BRIEF HISTORY, CHIEF CHARACTERISTICS
AND POINTS OF EXCELLENCE

OF

LEADING BREEDS OF SWINE

REARED IN CANADA

BULLETIN No. 11

Published by direction of the Hon. SYDNEY A. FISHER, Minister of Agriculture, Ottawa, Ont.

JANUARY, 1907

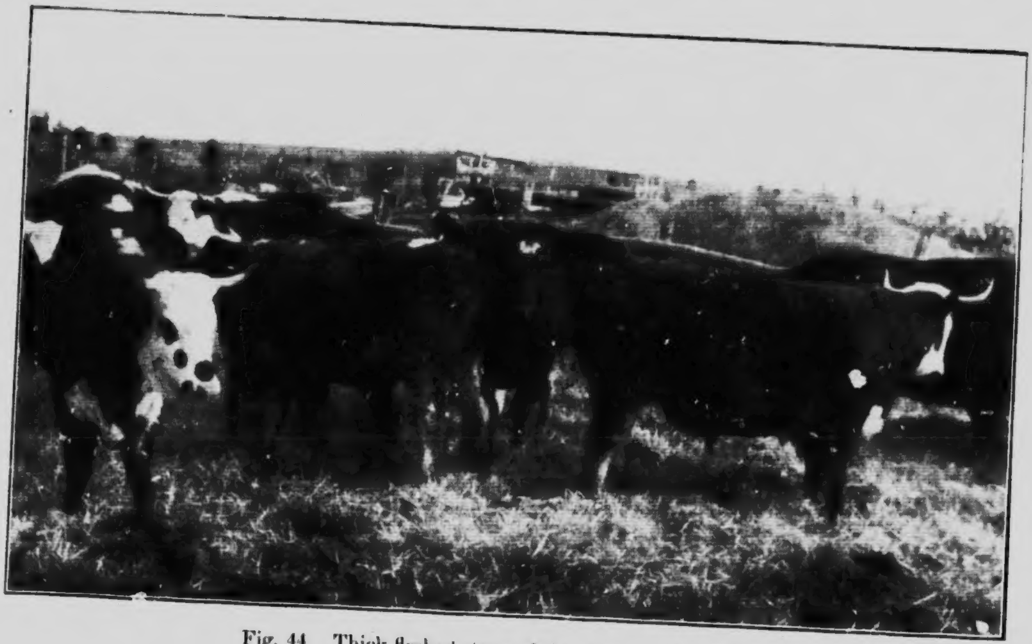


Fig. 44. Thick fleshed steers, fed in the open in Alberta.

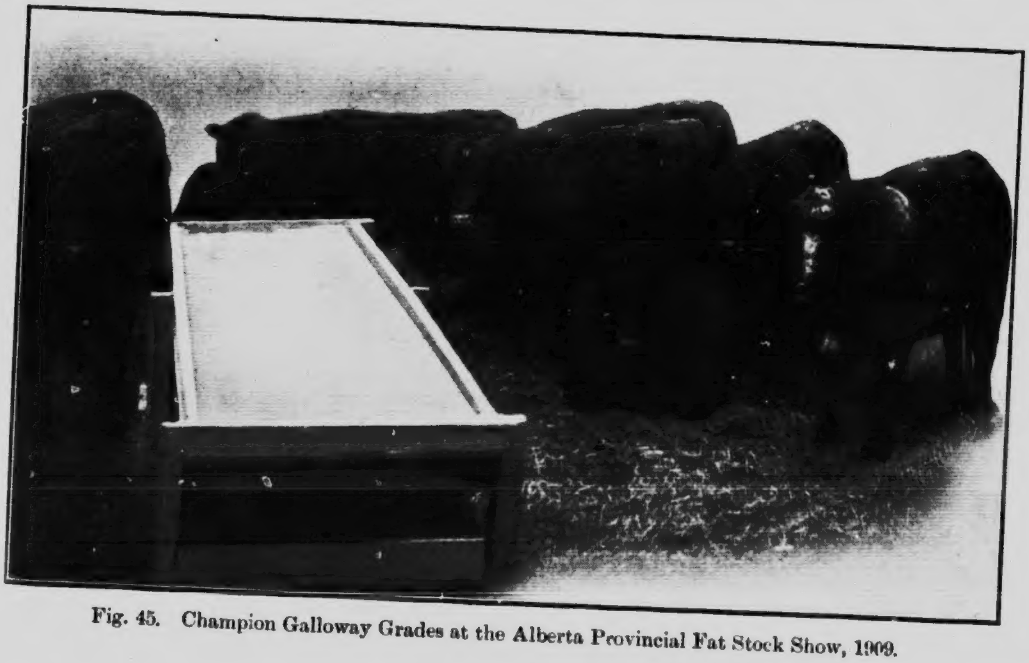


Fig. 45. Champion Galloway Grades at the Alberta Provincial Fat Stock Show, 1909.

To the Ho
The

Sir,—
acteristics
and would

Department of Agriculture, Canada,
Office of Live Stock Commissioner,
Ottaw. January 10, 1907.

o the Honourable
The Minister of Agriculture,
Ottawa, Ont.

Sir,—I beg to transmit herewith a bulletin being a 'Brief History, Chief Char-
teristics and Points of Excellence of the Leading Breeds of Swine Reared in Canada,'
d would recommend that it be printed for distribution.

I have the honour to be, Sir,
Your obedient servant,

J. G. RUTHERFORD,
Live Stock Commissioner.

THE

Almo
generally
According
the colou
brown, its
and soil u
It is chron
comparati
swine wer
slate colou
body is lo
the tenden
is black an
symmetric
are little a
the work c
materially

With t
farm anim
feeding wa
of the pres
be of much
progressive
distinct bre
sumption, t
the various
the best sp
by the alte
finement in
and lasting
erectness of
the head to
extension o
pendulous e
the ground,
came about
ments and d

LEADING BREEDS OF SWINE.

THEIR ORIGIN, DEVELOPMENT AND POINTS OF EXCELLENCE.

INTRODUCTION.

Almost all countries within the temperate zone have had their wild hogs. It is
enerally believed that the different varieties are all descended from one original stock.
ccording to historians, the original wild hog was of a rusty grey colour when young,
he colour deepening as the animal reached maturity and becoming a dark chestnut
rown, its hairs tinged with grey at the extremities, as old age crept over it. Climate
nd soil undoubtedly affected the colour as well as the form to a considerable extent.
t is chronicled that the native swine of Sierra Leone were small in size and bone, with
omparatively little lean meat, and nearly black in colour; in New Zealand the original
vine were much the same. In Siberia the swine are stated to be very small and of a
ate colour. The native hog of China is delicate and sensitive to cold; in form its
ody is low and trailing with drooping back and thin hams. The delicacy of its flesh,
e tendency to fatten, and prolificacy are its chief considerations. The hog of Naples
black and without bristles; it has a leg of medium length and a very cylindrical and
mmetrical body. The quality of the flesh is good, but the animals are not hardy and
e little adapted for general use in more northern climates. Thus we see that before
e work of systematic improvement began the hog stock of the world differed very
aterially according to the environment in which they were placed.

With the advance of agriculture there came about a corresponding improvement in
rm animals, including hogs. The best specimens were perpetuated, more generous
eding was resorted to, and improved foreign blood was introduced. In the formation
the present popular breeds, crosses of the hogs of China and Naples were found to
of much advantage in reducing coarseness of form and of flesh. The continued and
ogressive improvements in the breeding of swine led to the formation of the present
tinct breeds. The fancy of the breeder and the local use of peculiar articles of con-
mption, together with the quantity and kind of food given, have contributed to fix
various types. The large improved breeds have been produced by propagating from
best specimens of the old English hog, by persevering in judicious selection, and
the altered circumstances of maintenance and domesticated accommodation. Con-
ement in sheltered abodes, along with an ample supply of food, soon effected great
lasting changes in the entire conformation of the body of the hog. The narrow
ctness of the back of the forest ranger was depressed until it was nearly level from
head to the tail; the ribs were much more curved, largely increasing the lateral
ension of the carcass; the snout was shortened, the head widened, and the long,
dulous ears were much reduced in size. The widening of the body brought it nearer
ground, shortening the legs and expanding the frame. With these changes there
e about breeding to type and colour in the various localities, as suited the require-
ts and desires of the hog raisers, resulting, in the course of time, in the establish-

ment of the present pure breeds which are to be found throughout those countries where advanced agriculture is carried on.

While many pure breeds of swine have been evolved and are bred for meat production, only a comparatively small number have become popular in Canada, and the tendency is towards a further reduction of this number. During the past two decades the tendency had been towards the production of hogs suited to the requirements of the bacon trade, with the result of popularizing those breeds best adapted to this purpose.

The breeds of swine most commonly bred from in Canada are the Yorkshire, the Tamworth, the Berkshire, and the Chester White. The Poland-China and the Duroc-Jersey are also bred to some extent. The Yorkshire and the Tamworth are recognized as being especially suitable for bacon production; while the Berkshire and the Chester White of the improved type occupy an intermediate position between the bacon and the lard types. The remaining two belong to the fat or lard producing class, very popular in the corn belt of the United States. The relative numerical standing in Canada of the breeds named is fairly well indicated by the fact that in 1906 there were in the membership of the Dominion Swine Breeders' Association 185 breeders of Yorkshires, 147 of Berkshires, 37 of Tamworths, 28 breeders of Chester Whites, 8 of Poland-Chinas, and only 3 of Duroc-Jerseys.

Pedigrees of pure bred swine of any of the breeds described in the foregoing pages may be recorded in the Dominion Swine Breeders' Record. Members of the Dominion Swine Breeders' Association are charged for registration, including certificate, 50 cents each; non-members, $1; transfers, 25 cents each. The cost of membership in the Dominion Swine Breeders' Association is $2 per annum. Application forms, giving rules of entry, may be procured from the Accountant, National Live Stock Records, Department of Agriculture, Ottawa.

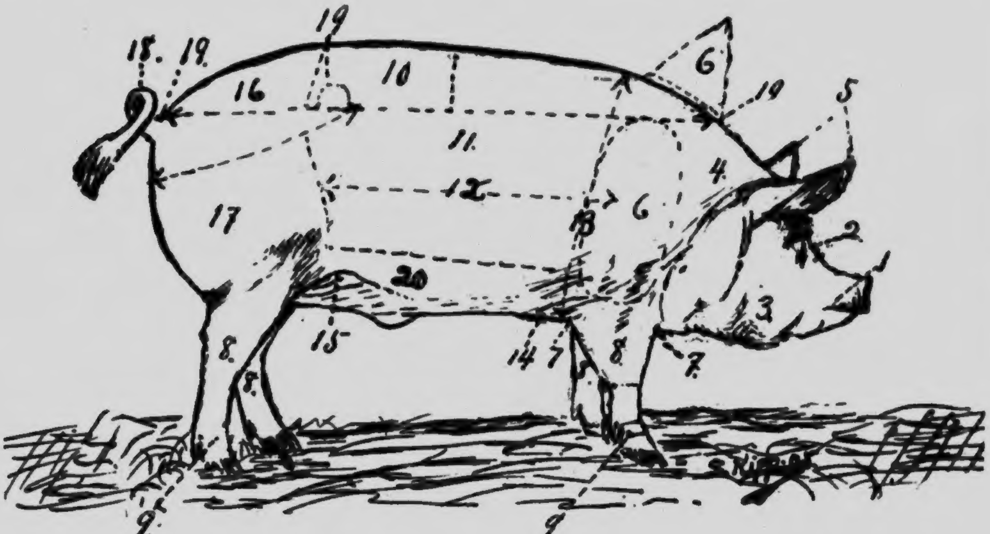


DIAGRAM SHOWING LOCATION OF POINTS OF THE HOG.

1. Snout.
2. Face.
3. Jowl.
4. Neck
5. Ears.
6. Shoulder.
7. Chest.
8. Leg.
9. Pastern.
10. Loin.
11. Ribs.
12. Side.
13. Girth.
14. Fore-Flank.
15. Hind-Flank.
16. Rump.
17. Ham.
18. Tail.
19. Back.
20. Belly.

THE YORKSHIRE.

The Yorkshire hog of to-day is claimed by historians of the breed to have descended most directly from the old English hog common in the northern counties of England far back as the beginning of the eighteenth century. This hog was long in head and dy and stood high off the ground. He was narrow in body, coarse in bone, had very rge ears, and took a long time to mature.

Little was done to improve the breed until about 1760, when Robert Bakewell, the mous stock improver of that time, is said to have applied the principles by which the glish Leicester sheep was evolved from the old type. This was to perpetuate only e smaller, finer and more compact animals, which he found had a greater aptitude to ten than the more rangy and coarser types. Some authorities claim also that the rkshire was much helped by the introduction of crosses of the White Leicester, a ed of swine of a finer and thicker type than the Yorkshire was at that time.

There appears to be comparatively little knowledge of the improvers of the breed ing the early part of the nineteenth century, but it is probable that many farmers a hand in the work. The Yorkshire man, as is well known, is a lover of good stock, it is not surprising to find that the swine kept in the county of York were equal, not superior, to those found in any other part of the country. With the advent of petition at the district week-end fairs, the general farmer was incited to improve stock, until, some fifty years ago, it was not unusual to find the displays of pigs at best of those fairs quite as good as those seen at much larger shows in other dis- ts. Unfortunately, the classification at the district meetings was not such as tended urity of breeding, the prizes very frequently being offered for the best pigs of a icular colour, which in Yorkshire was chiefly white. This led breeders to pay close ation to the securing of size, easy fattening and early maturing qualities, irrespec- of those points which are looked for in an established breed. The improvement ted was marked and rapid, and owners were able to bring out heavily-fleshed boars sows of fine quality for the classes limited to pigs under six, nine and twelve ths old—classes which were looked upon with special favour by the exhibitors at listrict summer shows.

Owing to a lack of unison on the part of breeders, improved animals found in ent localities and in different herds were of quite dissimilar type; and it was not about 1860, when a classification for Yorkshires was provided by the leading s, that the type of the large Yorkshire was well fixed.

The improved Yorkshire is one of the largest breeds of swine. It is longer than f the others, but its thickness is not so great as those breeds which have been ped chiefly for heavy weights and the production of fat. It grows rapidly and uality of its meat is unexcelled, as its long, deep sides produce much bacon of the d lean class.

'or crossing or grading purposes the improved Yorkshire is unsurpassed on account size, vigour, muscular development and other desirable qualities which it strongly nits to its offspring. The sows have large litters of uniform pigs, of which they good proportion. They seldom become clumsy at farrowing time, a vicious

Yorkshire Boar.

Winner of First Prize at the Royal, Bath and West, Highland, and other British Shows.

Yearling Yorkshire Sow.

Winner of First Prize, Ontario Winter Fair, Guelph, 1906.

dam is almost unheard of in the breed, and they are excellent nurses, while the young are vigorous from the first.

Improved Yorkshire swine have been imported into Canada for many years. Many specimens of the early importations, and of even those brought out as late as 1890, were of the coarse, rangey, slow maturing sort. Where these were distributed the Yorkshire breed did not grow in favour. In recent years, however, the tendency has been to revert somewhat from the extreme length and size which were held in favour by the early breeders of bacon pigs, until the modern Yorkshire is a smooth, lengthy animal that matures fairly early and makes very economical gains either in the pen or on pasture upon the food it consumes. Animals of this breed are active and yet gentle in disposition, and they very rarely go off their feet. A mature boar in show condition should weigh not less than 700 lbs., and a mature sow 600 lbs. Well nourished pigs from six to seven months old should reach a marketable condition weighing from 180 to 220 lbs.

The typical Yorkshire is long and deep in proportion to width; symmetrical and smooth; its back is slightly arched; the ribs well sprung; its underline and sides trim, straight and level and its body is firmly supported by well placed legs of medium length.

The points of excellence for Yorkshire swine should conform as nearly as possible to the requirements of the bacon trade, with due regard for constitutional vigour and easy feeding qualities.

The following scale prepared by the members of the staff of the Live Stock Commissioner is believed to correspond with the points of the ideal Yorkshire as seen in the leading show yards of the present day. It is general inasmuch as it applies to the Yorkshire breed irrespective of sex. Due allowance must, therefore, be made when scoring mature boars and breeding sows granting masculinity in the former and matronly conformation in the latter.

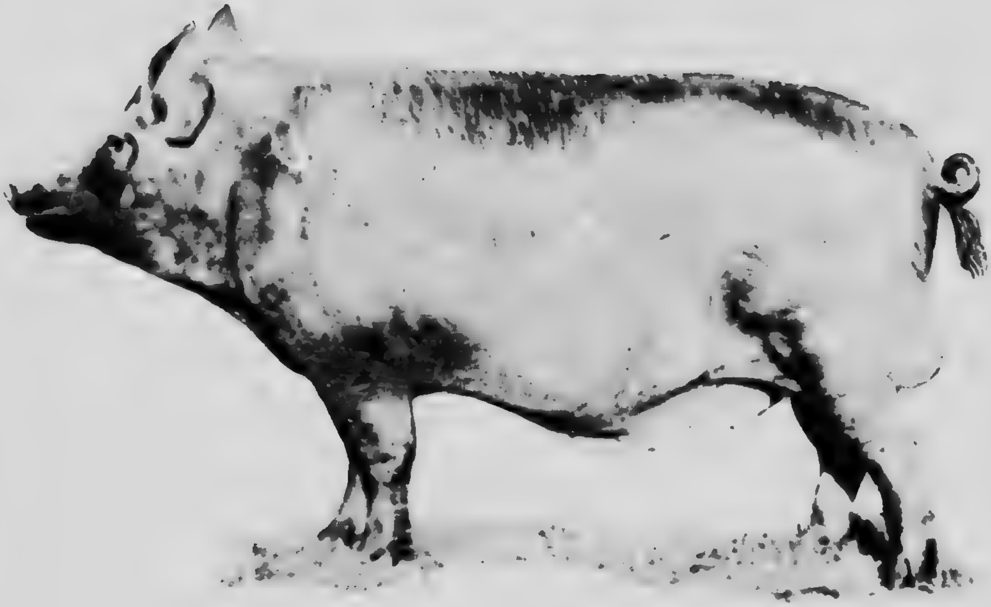
SCALE OF POINTS.

		Student's Score.
Colour—		
White, free from black hairs, and as free as possible from blue spots on the skin	2	
Head and Neck—10 points—		
Face slightly dished, broad between eyes, poll wide and prominent	2	
Snout, moderately strong but not coarse, of medium length, turning upward with slight curve	1	
Eyes, good size, full and bright and wide apart	1	
Jowl, neat form and of medium size without flabbiness, having good width at the angles of the jaw	2	
Neck, medium length and muscular, with little tendency to arch on top in the case of sows and barrows	3	
Ear, medium to large in size, with fine fringe, standing well out from the head, not drooping, and inclining slightly forward	1	

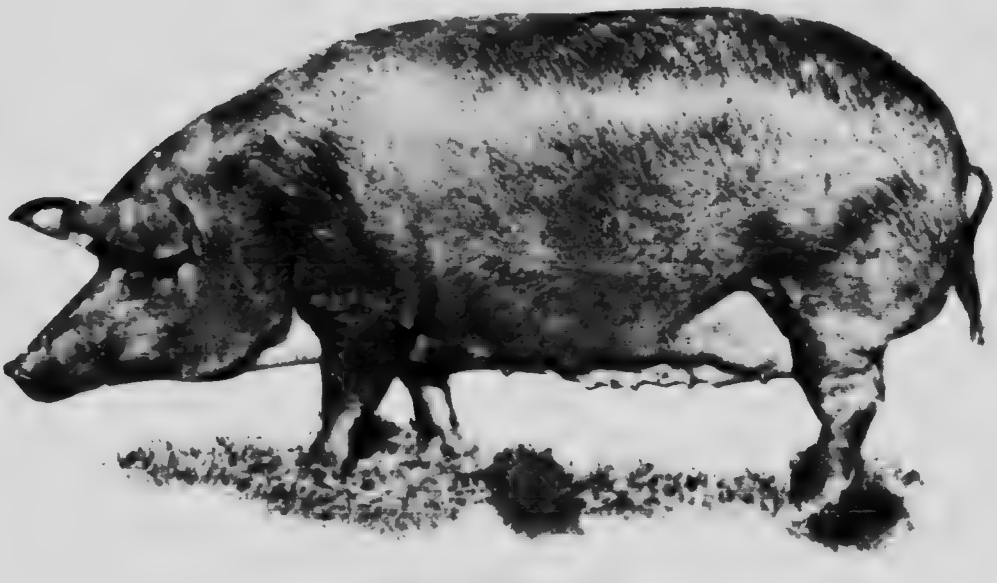
SCALE OF POINTS—*Continued.*

		Student's Score.
Forequarters—14 points—		
Shoulders, full, smooth, rounded from side to side, not open on top, compact, no wider than back..	8	
Breast, good width and full; chest full and low..	4	
Fore-legs, set well apart, medium length and straight; pasterns upright, bone clean and moderately fine; feet compact without tendency to spread when walking..	2	
Body—40 points—		
Back, medium width, rising slightly above the straight line and forming a very slight arch from neck to tail..	9	
Loin, muscular and full, but not unduly arched, wide as rest of back..	5	
Ribs, well arched from back, dropping straight, giving flatness to the side..	3	
Side, deep, long, smooth and straight between shoulder and ham, a straight edge laid over shoulder point and ham should touch the side throughout..	12	
Heart-girth, full, but without flabbiness or wrinkling; there should be no tucked-up appearance back of fore legs, nor slackness back of shoulder top..	5	
Flank, full and low..	1	
Underline, straight; the belly should be markedly trim and neat unless in case of broad sows..	5	
Hindquarters—14 points—		
Rump, same width as back, long and slightly rounded from a point above hips to tail, and rounded from side to side over top..	5	
Ham, full without flabbiness, thigh tapering toward hock, carrying flesh well down both inside and outside of bone..	4	
Hind legs, medium length, hocks set well apart but not bowed outwards; pasterns strong and upright; feet, compact without tendency to spread when walking.	4	
Tail, set high, medium strength, inclined to curl, with tassel of fine hair..	1	
Quality—15 points—		
Ear, rather thin, firm and of medium size (1) hair, fine and abundant without curl or bristles (2); skin, smooth, showing no tendency to wrinkle (3); bone, strong and clean in legs, moderately fine in snout and head, and showing no prominence on side and top of shoulder (4); flesh, firm and smooth, with no flabbiness at jowl, fore-flank, belly or ham (5).. ..	15	
Style—5 points—		
Active in movement, walking without a swaying motion and standing well up on pasterns..	5	
Perfection..	100	

Objections.—Narrow or excessively broad or sagging back; too thin or too short, thick or arching neck; sagging belly unless in brood sows; small cramped chest; pronounced depression back of shoulder; heavy shoulder; heavy shields on shoulders of boars; wrinkled skin; crooked or deformed legs or feet; black hairs, black spots, curly coat or swirls; very short or very long snout.



MATURE TAMWORTH BOAR.
WINNER OF SWEEPSTAKES AWARD, CANADIAN NATIONAL EXPOSITION, 1906.



MATURE TAMWORTH SOW.
WINNER OF SWEEPSTAKES AWARD, CANADIAN NATIONAL EXPOSITION, 1906

Tl
been in
of oth
Englan
plentif
is said
the bre

Du
shire, S
animal
found i
the limb
hardy, g
in body
have pro

In l
under cu
the effor
Neapolit
that had
sandy pig
or sandy
qualities
pig had b
breed won
shire, Ess

Fortu
other bree
take the T
Improveme
of body, ar

For a
attention o
against the
quite unsui
constantly
some of the
established
an importar
classificatio
are long, sn
their carriag

THE TAMWORTH.

The Tamworth is probably the purest of the modern breeds of swine; it having been improved more largely by selection and care than by the introduction of the blood of other breeds. One historian claims that foundation stock was introduced into England from Ireland by Sir Robert Peel about 1815, but others speak of its being plentiful in the Midland counties of England previous to that date. Sir Robert Peel is said to have maintained a herd of this sort near the town of Tamworth (from whence the breed takes its name), in South Staffordshire until the time of his death, in 1850.

During a long period the breed was little seen outside of the counties of Leicestershire, Staffordshire and Northamptonshire. It was at that time a dark red and grisly animal that was able to thrive on pasture during the summer and beachnuts and acorns, found in the forests, during the fall and early winter. The original stock was long in the limb, long and thin in the snout and head, and flat in the rib. The pigs were active, hardy, good grazers and very prolific, but were slow in maturing. Being rather spare in body they carried very little fat, and when fatted and slaughtered they are said to have produced a large proportion of flesh.

In later times, after the country had become inclosed and land began to be brought under cultivation, a quieter pig, with a greater disposition to fatten was desired. In the effort to produce such an animal crosses of pigs having a strong infusion of Neapolitan blood were introduced. It is also said that a few breeders used a white pig that had been improved by Bakewell. The result of the mixture was a black, white and sandy pig. In the hands of breeders in certain districts of Staffordshire, all but the red r sandy colours were bred out, and pains were taken by selection to increase the feeding ualities of their pigs, and by the middle of the last century a very desirable class of ig had been evolved. It is claimed on good authority that a sow of the Tamworth reed won first prize at the Northampton show in 1847 in a class which included Berkhire, Essex and other improved breeds.

Fortunately the class of men who had undertaken the improvement of some of the her breeds, by sacrificing almost everything to an aptitude to fatten, did not underke the Tamworth; hence the preservation of the length and prolificacy of the breed. nprovement was accomplished by reducing the length of limb, increasing the depth body, and improving the feeding qualities of the animals.

For a number of years previous of 1870 the breed received comparatively little tention outside its own home. About that time the bacon curers opened a campaign ainst the then fashionable, short, fat and heavy-shouldered pigs, which they found ite unsuitable for the production of streaked side meat for which the demand was nstantly increasing. The Tamworth then came into prominence as an improver of ne of the other breeds, in which capacity it was a decided success owing to its longablished habit of converting its food into lean meat. This breed at once assumed important place among the best sorts in Britain. Tamworths were given a separate sification at the Royal and other British shows about 1885. In general outline they long, smooth and fairly deep, having a moderately light fore-end and deep ham; r carriage is easy and active on strong, straight legs.

The Tamworth belongs to the large breeds, reaching weights almost equal to the Yorksire. Mature boars in show condition should weigh from 650 to 700 lbs; and sows about 600 to 650 lbs. Sows and barrows that are wisely and well reared are ready for the packers at about seven months of age, weighing from 180 to 200 lbs.

The points of excellence for the Tamworth, as in the case of the improved Yorkshire, should conform as nearly as possible to the requirements of the bacon trade. without overlooking constitutional vigour and easy feeding qualities. The following scale has been prepared with a view of describing the ideal Tamworth of the present day. It is general inasmuch as it applies to the Tamworth breed irrespective of sex. When judging mature boars and breeding sows due allowance should be made for masculinity in the former and matronly conformation in the latter.

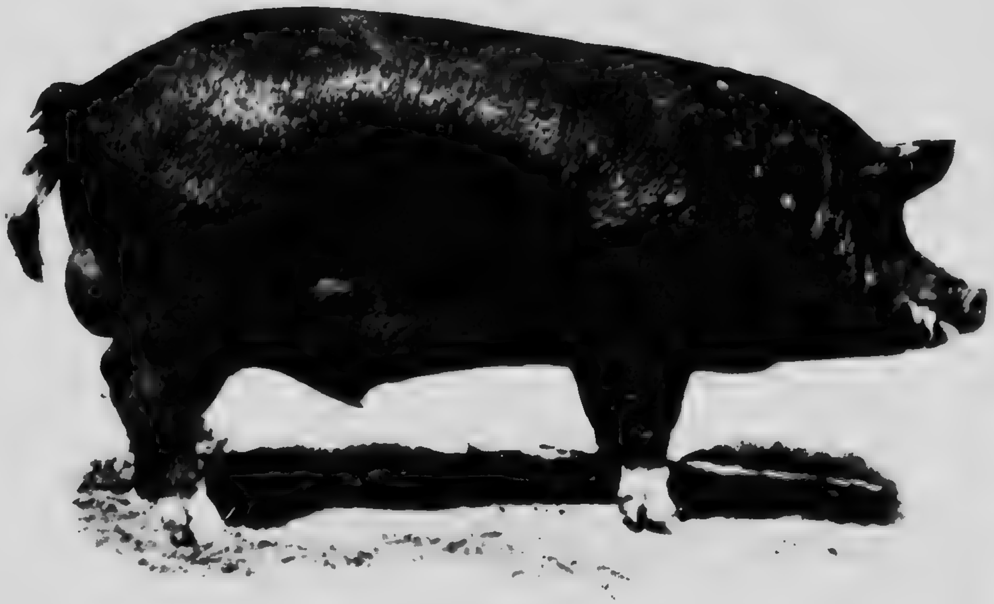
SCALE OF POINTS.

		Student's Score.
Colour—		
Red or bright chestnut on flesh-coloured skin, free from black spots.	2	
Head and Neck—9 points—		
Snout, moderately fine, long and quite straight.	1	
Face slightly dished, poll wide and prominent.	1	
Eyes, good size, full and bright, and moderately wide apart.	1	
Jowl, light and neat.	3	
Neck, medium length, deep and rather light, with no tendency to arch on top.	2	
Ear, rather long with fine fringe, carried rigid but inclined slightly forward.	1	
Fore-Quarters—15 points—		
Shoulders, light and smooth, rounded from side to side over top and very compact, no wider than back. . . .	8	
Breast, good width and full; floor of chest well let down	5	
Fore-legs, set well apart, medium length and straight, pasterns upright, bone clean and moderately fine, feet compact without tendency to spread when walking	2	
Body—40 points—		
Back, medium width, rising slightly above the straight line and forming a slight arch from neck to tail. . . .	8	
Loin, strong and full, but not unduly arched, wide as rest of back.	5	
Ribs, good length, well arched from back, falling straight, giving flat, deep side.	4	
Side, deep, long, smooth and straight between shoulder and ham, a straight edge laid over shoulder point and ham should touch the side throughout.	12	
Heart-girth, full but not flabby; there should be no tucked up appearance back of fore legs, nor slackness back of shoulder top.	5	
Flank, full and low.	1	
Underline, straight; the belly should be markedly trim and neat unless in case of brood sows.	5	

SCALE OF POINTS—*Continued.*

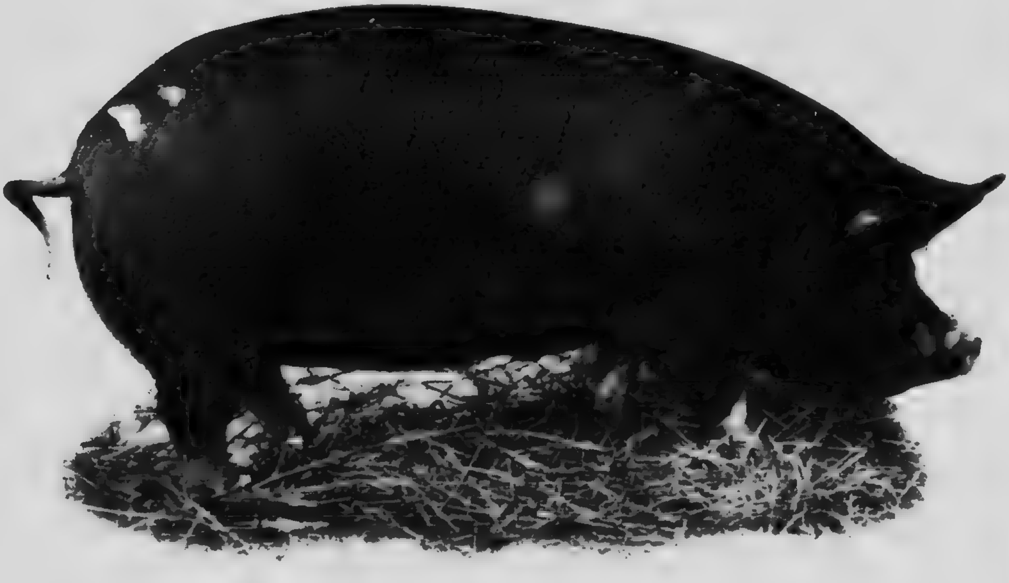
		Student's Score.
Hind-Quarters—14 points—		
Rump, same width as back, long and slightly rounded from a point above hips to tail and rounded from side to side over top.	5	
Ham, full without flabbiness; thigh tapering towards hock, carrying flesh well down both inside and outside of bone.	4	
Hind legs, medium length, hocks set well apart but not bowed outward; bone clean and moderately fine; pasterns strong and upright; feet compact without tendency to spread when walking.	4	
Tail, set high, inclined to curl, medium length and strength, tasseled.	1	
Quality—15 points.—		
Ear, rather thin, fringed, firm and of medium size (1) hair fine and abundant and free from bristles (2); skin smooth, showing no tendency to wrinkle (3) bone clean in legs, moderately fine in snout and head and showing no prominence on side and top of shoulder (4); flesh firm and smooth, with no flabbiness at jowl, fore flank, belly or ham (5).	15	
tyle—5 points—		
Active in movement, walking without a swaying motion and standing well up on pasterns.	5	
Perfection.	100	

Objections.—Narrow or excessively broad or sagging back; too thin or too short, ick or arching neck; sagging belly unless in brood sows; small cramped chest; onounced depression back of shoulder; heavy shoulder; prominent shields on boars; inkled skin; crooked or deformed legs or feet; short or turned up snout; black or ry light or curly hair, or swirls; slouch or drooping ears.



Yearling Berkshire Boar.

Winner of First Prize, Canadian National Exposition, 1906. This boar represents the modern bacon type of Berkshire.



Yearling Berkshire Sow.

Winner of First Prize, Canadian National Exposition, 1906. This sow represents the modern bacon type of Berkshire.

The
century
land, whe
in body
brown, w
siderable
by histor
finer Chi
English h
desirable

It was
Royal Ag
became ke
to animals
it was not
prized at t
and length
vigorous.
by the time
were not so
under these
excellence o
who soon b
the product
High prices
deavouring
undergoing
show animal
to secure p
points aimed
and a fat ba
established i
the body were

With the
for imported
menced to gi
the past centu
the symmetri
popularity in
entirely suite
to the lard ty

THE BERKSHIRE.

The Berkshire is one of the oldest of the improved breeds of swine. More than a century ago it was bred in large numbers in and about the county of Berkshire, England, whence it obtained its name. At that time it was a large animal, somewhat coarse in body and having large pendent ears. In colour it varied from tawny to reddish brown, with black spots. Early in the nineteenth century the breed underwent con- iderable improvement, both in Berkshire and in the adjoining counties. It is claimed y historians that improvement was effected by the introduction of crosses of the iner Chinese and Neapolitan breeds and the perpetuation of the finer types found in nglish herds. About the year 1825 the breed had assumed a fairly uniform and esirable type, and the darker colours began to be quite general.

It was not until 1862 that the breed was given a separate class at the show of the oyal Agricultural Society of England. Soon after this, competition in the show ring ecame keen between the various improvers of the breed, each confining his exhibits o animals of his own breeding. The benefits derived from this were very marked, and was not long before the breed reached a point of excellence that would be highly rized at the present time. They were of fine appearance and very hardy, of good size d length and yet without coarseness. The sows were prolific and the offspring gorous. They matured early, producing a thick carcass of lean meat of fine quality the time they were twelve months old. Up to this time the improvers of the breed re not so anxious about external markings as the commercial value of the animals; der these favourable conditions a very desirable class of hog was produced. The ellence of the breed became so marked that it attracted the attention of rich men, o soon became its fanciers and exhibitors and whose first thought too frequently was production of prize winners of such a type and formation as pleased their whims. gh prices were paid for certain extreme types, which naturally set breeders en- vouring to produce the kind that found favour. During this period the breed was ergoing an undesirable change, which was fostered still more by a keen demand for w animals from buyers in the United States. The main aim of these importers was secure prize winning animals, or such as conformed to their fancy. The chief ts aimed at were a short turned-up snout, heavy jowl, thick neck, wide shoulders a fat back. The colour of the present day Berkshire was at that time fairly well blished in the breed, although a white splash on the side and reddish marks about body were not uncommon.

With the advent in the United States of the thick fat Poland-China, the demand imported Berkshires dropped off very considerably and English breeders com- ced to give attention to lengthening the form of their stock. Towards the end of ast century the breed had become considerably lengthened, and as a result we have ymmetrical, fairly long, fleshy type of Berkshire. While this breed retains its larity in Canada in a marked degree, it can not as yet be said to have become ely suited to the requirements of the packers. Numbers of breeders still adhere e lard type, while many others are perpetuating only the longer and more fleshy representatives of their herds. For bacon production a cross between the Berkshire and the Yorkshire or Tamworth finds favour with both the producer and the packer. The Berkshire is an easy feeder, quite hardy and fairly prolific. It is not as large at maturity as the Yorkshire or the Tamworth, but it attains heavy weights when selected and reared with a view to size.

Mature boars in show conditions should weigh not less than 550 lbs., and mature sows in similar flesh not less than 450 lbs. The Berkshire requires about seven months of moderate feeding in order to be ready for the export bacon trade, weighing about 200 pounds.

In general outline the Berkshire is moderately long and deep; the body is symmetrical and proudly carried on strong, well-placed legs.

The points of excellence for the breed, from the standpoint of the Canadian breeder, should conform as nearly as possible to the standards set up for the Yorkshire and the Tamworth, having, however, due regard to form and markings characteristic of the breed.

When judging breeding stock due regard must be given to masculinity in boars and slightly more open conformation in sows than is called for in the scale of points.

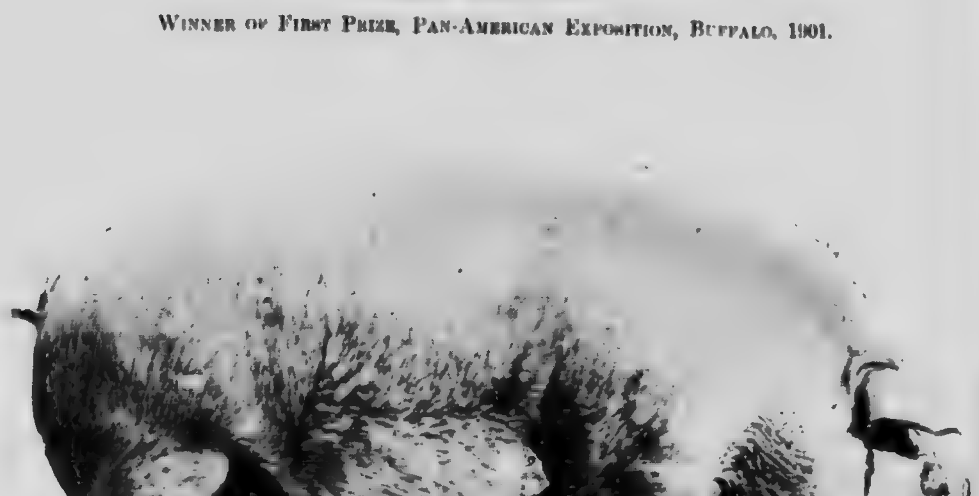
SCALE OF POINTS.

		Student's Score
Colour—		
Black, with white on feet, face and tip of tail, and an occasional small splash on the arm.	2	
Head and Neck—9 points—		
Snout of medium strength and fine; face moderately dished.	1	
Poll broad and prominent.	1	
Eyes, good size, full, and bright.	1	
Jowl, moderately full, firm and neat.	3	
Neck, medium length and fulness, with no tendency to arch on top in the case of sows and barrows.	2	
Ears generally almost erect, but sometimes inclined forward with advancing age.	1	
Fore-Quarters—15 points—		
Shoulders, neat and smooth, rounded from side to side over top and very compact; no wider than back. .	9	
Breast, good width and full, chest full and low.	4	
Fore-legs, set well apart, medium length and straight, pasterns upright, bone clean and moderately fine; feet compact without tendency to spread when walking.	2	
Body—40 points—		
Back, medium width, rising slightly above the straight line and forming a very slight arch from neck to tail.	9	
Loin, strong and full but not unduly arched; wide as rest of back.	5	
Ribs, good length and well arched.	3	

		Student's Score.
dy—Continued.		
Side, deep, long, smooth and straight between shoulder and ham; a straight edge laid over shoulder point and ham should touch the side throughout	12	
Heart-girth, full but not flabby at fore flanks; there should be no tucked up appearance back of fore legs nor slackness back of shoulder top	5	
Flank, full and low	1	
Underline straight; the belly should be markedly trim and neat unless in case of brood sows	5	
d-Quarters—14 points—		
Rump same width as back, long and slightly rounded from a point above hips to tail, and rounded from side to side over top	5	
Ham full without flabbiness; thigh tapering towards hock, carrying flesh well down	4	
Hind legs medium length, hocks set well apart but not bowed outward; bone clean and moderately strong, pasterns strong and upright, feet compact without tendency to spread when walking	4	
Tail well set up on line with back, tapering, bearing white tassel	1	
ity—15 points—		
Ear rather thin, firm and of medium size (1); hair fine, abundant and free from bristles (2); skin smooth, showing no tendency to wrinkle (3); bone clean in legs, moderately fine in snout and head, and showing no prominence on side and top of shoulder (4); flesh firm and smooth, with no flabbiness at jowl, fore flank, belly, or ham (5)	15	
—5 points—		
ctive in movement, walking without a swaying motion and standing well up on pasterns	5	
Perfection	100	

jections.—Narrow or excessively fat, broad or sagging back; too thin or too hick or aching neck; sagging belly unless in brood sows; small cramped chest; houlder; prominent shields on boars; pronounced depression back of shoulders; d skin; crooked or deformed feet or legs; very large and heavy or drooping lack points, or white or sandy spots on body, or swirls.

Chester White Boar.
Winner of First Prize, Pan-American Exposition, Buffalo, 1901.



Chester White Sow.
Winner of First Prize, Pan-American Exposition, Buffalo, 1901.

The (
breed orig
having co
An impro
Brandywin
Bedfordsh
menced an
of the in
the origina
leading fa
system of
securing a
continuous
demand for
provided ur
pigs of all
The reactio
demand for
able to agai
in quality,
large breeds
of breeding
quarter of t
become one
early matur
sought, by s
upon with f
tween the ba
rather a 'C
most of the
formation.

Boars in
the same ag
weigh from 1

The stan
States Recor
shoulders an
standpoint of
requirements
istics of the
due allowance
females.

THE CHESTER WHITE.

The Chester White hog is a native of Chester county, Pennsylvania, where the reed originated early in the nineteenth century. It was a large, white, coarse animal, aving coarse head, heavy, lopped ears, coarse hide, long heavy tail and coarse hair. n improvement of the breed was commenced by the introduction, on a farm near randywine Creek, in Chester county, of a pair of very fine white hogs imported from edfordshire, England, in the year 1816. Enterprising farmers of the districts com- enced an improvement of their swine by the introduction of the prepotent blood the imported stock. The produce of the first cross was so much superior to e original stock of the country that the new blood was eagerly sought by most of the ading farmers of the district. Encouraged by the improvement already secured, a stem of careful selection and breeding was undertaken, with the chief object of curing a more suitable animal for the market. The improvement is said to have been ntinuous until the breed acquired an enviable reputation over a wide territory. The mand for breeding stock soon exhausted the available animals. This circumstance ovided unscrupulous men an opportunity for doing the breed a serious injury. White gs of all forms and descriptions were bought up and sent abroad as Chester Whites. e reaction was severe, as the breed received an unjustified condemnation. The nand for stock fell off seriously, and breeders of the genuine Chester White were e to again build up their herds. While the stock had undergone much improvement quality, no attempt had been made to reduce the size. [illegible] were classed among the ge breeds, and as such they reached the period when t[illegible]ders saw the wisdom breeding to a standard, which they began to do about [illegible] beginning of the last rter of the past century. Since that time improvement has been continuous. It has ome one of the most popular breeds throughout the United States on account of its y maturing and easy feeding qualities. In a few cases Canadian breeders have ght, by selection and management, to develop the form and quality of animal looked n with favour by the packers, and are now producing an animal intermediate be- en the bacon and lard types; but as bred in the United States, the Chester White is er a 'Corn Belt' than a bacon animal. As a grazing hog it is claimed to excel t of the other breeds. It is moderately long, thick and deep and uniform in con- nation.

Boars in show condition should reach 500 lbs. at two years of age; and sows of same age and condition, 450 lbs. Pigs six months old in market form should h from 150 to 175 lbs.

The standard of excellence for the Chester White, adopted by the various United es Record Associations, calls for an animal having well arched neck, broad lders and back—qualifications very undesirable for bacon production. From the dpoint of the Canadian breeder, the standard should be modified to conform to the rements of the bacon trade, as nearly as is consistent with the natural character- of the breed. When judging breeding animals by the following scale of points llowance must be made for masculinity in males and openness of conformation in les.

SCALE OF POINTS.

		Student's Score.
Colour—		
Hair white over pale pink skin	2	
Head and Neck—9 points—		
Snout, moderately fine, neat and tapering, face slightly dished	1	
Eyes, good size, full and bright, and fairly wide apart	1	
Jowl, full, neat and firm	3	
Neck, medium length and full, with only moderate tendency to arch on top	3	
Ears, medium size and thickness, soft, attached firmly to the head, pointing forward and slightly outward, and drooping	1	
Fore-Quarters—15 points—		
Shoulders, full, smooth, rounded from side to side over top and very compact, no wider than back	9	
Breast, good width and full; chest full and low	4	
Fore-legs set well apart, medium length and straight, pasterns upright, bone clean and moderately fine, feet compact and without tendency to spread when walking	2	
Body—40 points—		
Back, medium width, rising slightly above the straight line and forming a very slight arch from neck to tail	9	
Loin, strong and full, but not unduly arched; wide as rest of back	5	
Ribs, good length and well arched	3	
Side, deep, long, smooth and flat between shoulder and ham	12	
Heart-girth, full but without flabbiness at fore-flanks; there should be no tucked up appearance back of fore legs nor slackness back of shoulder top	5	
Flank, full and low	1	
Under line straight; the belly should be moderately trim and neat unless in case of brood sows	5	
Hind-Quarters—14 points—		
Rump, same width as back, long and slightly rounded from a point above hips to tail, and rounded from side to side over top	5	
Ham, full without flabbiness, thigh tapering towards hock, carrying flesh well down both inside and outside of bone	4	
Hind legs, medium length, hocks set well apart, but not bowed outward; bone clean and moderately fine, pasterns strong and upright; feet firm and compact without tendency to spread when walking	4	
Tail, small, smooth, tapering, well set on, not too high or low, curled	1	

SCALE OF POINTS—*Continued.*

		Student's Score.
Quality—15 points.		
Ear rather thin, firm and of medium size (1); hair fine and abundant (2); skin smooth, showing no tendency to wrinkle (3); bone well defined and clean in legs, moderately fine in snout and head, and showing no prominence on side and top of shoulder (4); flesh firm and smooth with no flabbiness at jowl, fore-flank, belly or ham (5)........................	15	
Style—5 points—		
Active in movement, walking without a swaying motion and standing well up on pasterns..............	5	
Perfection........................	100	

Objections.—Narrow or sagging back; too thin or too long neck; sagging belly unless in brood sows; small, cramped chest; pronounced depression back of shoulder; rough shoulder; prominent shield on boars; wrinkled skin; crooked or deformed legs or feet; black hairs, black spots, curly coat or swirls; very short snout; very large ears lying close to face or small stiff ears carried erect.

HERD OF POLAND CHINAS.
PRIZE WINNING PEN, PAN-AMERICAN EXPOSITION, BUFFALO, 1901.

THE POLAND-CHINA.

The Poland-China hog originated in the Miami valley, chiefly in the counties of Warren and Butler, in the state of Ohio. The conditions were favourable to swine growing, and the city of Cincinnati became, prior to the middle of the past century, one of the greatest pork packing centres in the world. Hog raising was at that time the most profitable feature of farming in the surrounding country. Since there were no railroads at that time fatted hogs had to travel on foot to market, so that activity of the animals was as important as easy feeding qualities. The hogs of the district were known by a variety of names, and were extremely cosmopolitan in their make-up. The foundation stock consisted of the native unimproved hog. Many settlers from Great Britain and other European countries brought hogs of varieties common in the dis-
tricts whence they came, and in this way a constant change in the stock of the country
vas affected. With the improvement of roads and the introduction of railways, the
activity of the animals became a secondary matter and they rapidly became thicker and
horter in the leg.

While hogs of various types were introduced into the Miami valley, the breeds
hat did most in improving the stock were the Berkshire, the Russian, the Big China,
he Byfield, and the Irish Grazier. From about 1820 to 1840 the main crosses, in-
trumental in the formation of what later became the Poland-China breed, were in-
roduced. The Berkshire gave the black colour and improved symmetry, the Big China
nproved the fattening qualities, while the other crosses gave size and strength.
ccording to authoritative writers, no outcrosses have been introduced since 1845.

Owing to the seemingly discordant elements of which it was made up, and the
ck of a standard, the breed, then known as 'The Warren County Hog,' underwent
any changes in conformation and colour prior to 1870. Up to this time the growing
d fattening qualities of the animals were considered of much greater importance
an colour or particular form. Having secured the desired qualities of fattening,
ding breeders, about the date mentioned, decided, in a general way, upon the form
d colour most desirable and upon the name Poland-China. Within a few years a
mber of organizations had been formed in the interests of the breed, and most of
se adopted about the same standard of excellence. Attention was given to hastening
turity and to improving the quality and fattening powers, until we now have in the
land-China one of the most economical meat-making hogs of the great 'Corn Belt'
the United States. Neither its form nor its carcass is in accordance with the re-
rements of the bacon trade; hence the breed is not looked upon with favour by those
ely associated with the development of the Canadian bacon industry.

In general appearance the Poland-China is compact, symmetrical, full and round,
oth and inclined to massiveness in build. The characteristic colour is black, with
te on face or lower jaw, white on feet and tip of tail; a few small clear white spot
ody are not objectionable. Boars two years old and over in good conditoin should
h not less than 500 pounds, and sows of same age and condition not less than 400
ds. With these points and the illustration of the group of Poland-Chinas shown on
pposite page a fairly accurate idea of the typical hog of this breed may be obtained.

DUROC JERSEY SOW.
WINNER OF FIRST PRIZE, PAN AMERICAN EXPOSITION, BUFFALO, 1901.

THE DUROC-JERSEY.

The Duroc-Jersey hog, according to the most authentic historians of the breed, is the outcome of a union of the two classes of red swine known respectively as the Durocs and the Jersey Reds. The latter have been known to exist in a condition of greater or less purity in New Jersey and other Atlantic states for upwards of 70 years, while the former was for a long time the leading hog raised in Saratoga county, New York. The Jersey Reds were large in size, rather fine in quality, and of fair length and thickness. It is believed that the Jersey Red is descended from the earliest importations of the Berkshires, which in their early days were of a variety of colours, including buff, sandy and reddish brown, spotted with black. It is considered probable that the Durocs were descended from the same parent stock, but of this there is less certainty. The two varieties were for many years kept amid different environments which would account for the lack of similarity between them when they were united, at a date prior to 1850, to form the Duroc-Jersey breed.

The breed, from its early days, has been noted for docility, prolificacy and hardihood, qualities which have been well maintained. Size and weight were aimed at by improvers through many generations, and some 25 years ago the average of the breed was larger than at the present day. In 1877 breeders in Saratoga and Washington counties, New York, agreed upon a standard of characteristics that has been varied but little by more recently formed record associations. During the past two decades the breed has been improved in quality, easy feeding and early maturing propensities, and is now held in about equal favour with the Poland-China and the Chester White n the leading pork producing areas of the United States.

The Duroc-Jersey has a few admirers in Canada, but its thick, fat form, as seen n the leading herds of the United States, is so unsuited to the requirements of the acon trade that its popularity has not extended to any extent north of the interational boundary.

The Duroc-Jerseys, with their moderately long, straight heads, drooping ears, and nooth, neat bodies, bear a rather close resemblance to the Poland-Chinas in form, but ey are somewhat stronger in limb. Boars two years old in good condition should eigh not less than 600 pounds, and sows of similar age and condition 500 pounds. heir colour is cherry red without other admixture. The accompanying illustration presents the form that is highly prized by fanciers of the Duroc-Jersey breed.

For close ranging, and on the smaller ranges where feed is more plentiful, the Shorthorn is preferred, while on the larger ranches where the animal's rustling abilities have to be depended on almost altogether, the Hereford has the preference. Yearlings, and upwards, are the age used and they are kept for about four years. One bull is turned out for every twenty-five or thirty cows and the calf percentage runs about 50 to 60 per cent. The calves are castrated in June and are weaned in November; they are usually fed hay all winter.

Thin cow stock are also fed some hay, while steers in this climate require some feeding about two winters in every five. Where feeding is carried on it is estimated that from 800 to 1,000 pounds of hay per head, consisting of clover, timothy and brome grass, will winter a mixed herd of cattle in fine condition under ordinary circumstances. Alfalfa is successfully grown in some districts where it provides an excellent winter feed; in other districts it winter kills badly. Under the above system three-year-old steers are turned off in the summer weighing from 1,200 pounds to 1,300 pounds, while cows run about 1,500 pounds.

Some years ago a few consignments of 'dogies' were brought from Ontario but they did not give satisfaction, and the shipments were discontinued.

Practically all the beef produced in British Columbia is marketed between June 15 and January 15, the price obtained being three cents for cows and three and one-half for steers at the railway shipping point. During the rest of the year the supply is obtained from Alberta. Much better prices would be obtained if the animals could be held over and marketed in the late winter and spring, but there is little prospect of this being done with hay running from $12 to $25 per ton.

A large modern abattoir has been established at Vancouver within recent years and many cattle are shipped there. The cattle buying and slaughtering business is falling into the hands of large concerns and the small retailer is rapidly disappearing.

It is expected that with the opening up of areas suitable for ranching in the northern part of the province which are now being tapped by railways, that the range cattle output will hold its own, but little change can be looked for in the immediate future in the districts already settled as other lines of animal husbandry offer much larger profits than the production of beef under existing conditions.

Predatory animals do not cause much loss on the ranges. Occasional losses are caused by bears and panthers but these do not amount to much. Owing to the country being more or less heavily stocked with game little loss of live stock is caused by wolves, which are able to get their food in the forests. Coyotes are not credited by ranchmen with doing much damage. Some cattle men would like to see them protected on account of their destruction of gophers and other animals of a similar nature.

Range cattle here are practically free from disease. Tuberculosis is almost unknown on the range, while cattle mange does not exist in British Columbia. A small outbreak of Black Leg was reported last year in the range country but, this should be easily controlled by the use of the preventive vaccine now supplied by the Health of Animals Branch at the nominal price of five cents per dose.

Great improvement could be made in the cattle industry by the irrigation of larger areas of land for the production of alfalfa and other suitable forage to be followed by a more liberal system of winter feeding. This should be coupled with a careful selection of breeding animals and the use of only pure bred sires of good quality.

The beef cattlemen of the province should form an association and heartily co-operate with one another, bearing in mind that in unity there is strength. One of the first objects of this association should be to improve market conditions and to ensure graded prices according to the quality of their stock. Another matter that will need attention in the near future is the systematic re-seeding of the ranges with the valuable bunch grass which apparently will be exterminated in some places if some method is not soon adopted for its conservation.

HOUSING.

The housing of cattle may be considered a necessary evil. Cattle would be better wintered out of doors were it not for the severe spells of weather which would cause suffering and loss. The disadvantages of the Canadian winter for cattle raising have undoubtedly been over estimated. In an effort to protect cattle against the climate it became the general practice among the more advanced stockmen some years ago to endeavour to maintain in the stable a temperature approaching June. In this the provision of nature to clothe the animals with a coat for the winter season was quite overlooked. Barns were built so close that they were kept warm from the bodies of the animals. Fresh air—the very life of live stock—was shut out, or so nearly so as to compel the inmates to breathe over and over again their own breath. The bank barn became a popular structure and was built as early and as expensively as the prosperity of the proprietor would allow. Many a farmer has burdened his business in order to build a stone basement barn, which, in later years, has come to be recognized as an enemy to the vigour of the herd. Actual experience has taught that the basement barn, as constructed with few windows and without provision for ventilation, is a failure and such are no longer built in progressive districts.

While as shown in the section of this bulletin for the western provinces cattle are being profitably fattened out of doors it is nevertheless necessary for best results to provide some sort of shelter for the breeding herds, young stock, and feeding cattle. Warmth, however, is not a necessity. So long as cattle are protected from cold winds, storms, and dampness, they will withstand moderately low temperatures without serious results. Nature supplies the necessary covering in a thickening and lengthening of the coat, provided the demand for it is allowed to assert itself naturally. In the prairie provinces, which have a dry atmosphere and plenty of sunshine, well grown, vigorous cattle thrive well out of doors if given shelter from the wind and a dry bed. In the eastern provinces the more moist and changeable climate makes outdoor winter feeding impracticable, so that for these provinces housing is necessary for all cattle during the winter season.

Good air, sunlight, and dryness are the chief considerations in a cattle barn. When to these are added convenience for work, economy of construction and maintenance, we have the essentials of a good barn. The shape is not important, provided it allows for the chief requirements. The round barn has its advocates, some prefer the square or rectangular form, while others again like the L-shape, or even two wings providing fine shelter for the yard. As a security against total destruction by fire two or more smaller buildings have advantages when separated by some distance. Undoubtedly the most popular barn for the cattle raiser has a basement, or lower story, beneath a roomy superstructure for storing food and bedding. Such an arrangement lends itself to economy of construction and convenience in feeding.

The lower story, which, for obvious reasons, should be built above ground, should not be less than 9 feet and need not be more than 11 feet high inside. The height of the superstructure will depend upon the storage room required, as modern fodder-lifting machinery overcomes height in filling. It is an advantage to build on a slight incline both for drainage and easy access to the barn floor. The wall should not, however, be built against a high bank. The back wall may be banked three or four feet high, provided numerous windows are arranged above it to let in the light.

Lighting.

The lighting of a cattle barn is of great importance, but it can in no measure take the place of ventilation. No disinfectant is as effective as sunlight in the destruction of microbes. Where light freely enters dirt and dust are likely to be removed. Cattle enjoy the sunshine and will choose it out of doors in a winter day before a close, dark stable. They need it for their comfort and health and the attendant requires it to enable him to keep the place clean and in order. Windows are as cheap as wall, and when double, they are quite as warm. To admit the maximum of light, windows should extend well down the wall. Bars or rods across the lower half will prevent breakage by the stock. While east, south and west, windows are most important, the north wall also should be supplied. It is hardly possible to admit too much light. About one-third of the wall above a line four feet from the floor should, when practicable, consist of windows. Nor should interior fittings be of such a nature as to obstruct the light. High partitions and feed racks are not necessary, and, as far as practicable, iron piping, or angle-iron, should be utilized for stalls. Heavy wire fencing for inclosing and dividing loose boxes is airy and substantial for young stock but bulls require more solid partitions. Such fittings not only allow the light to reach remote corners but also facilitate the working of a system of ventilation.

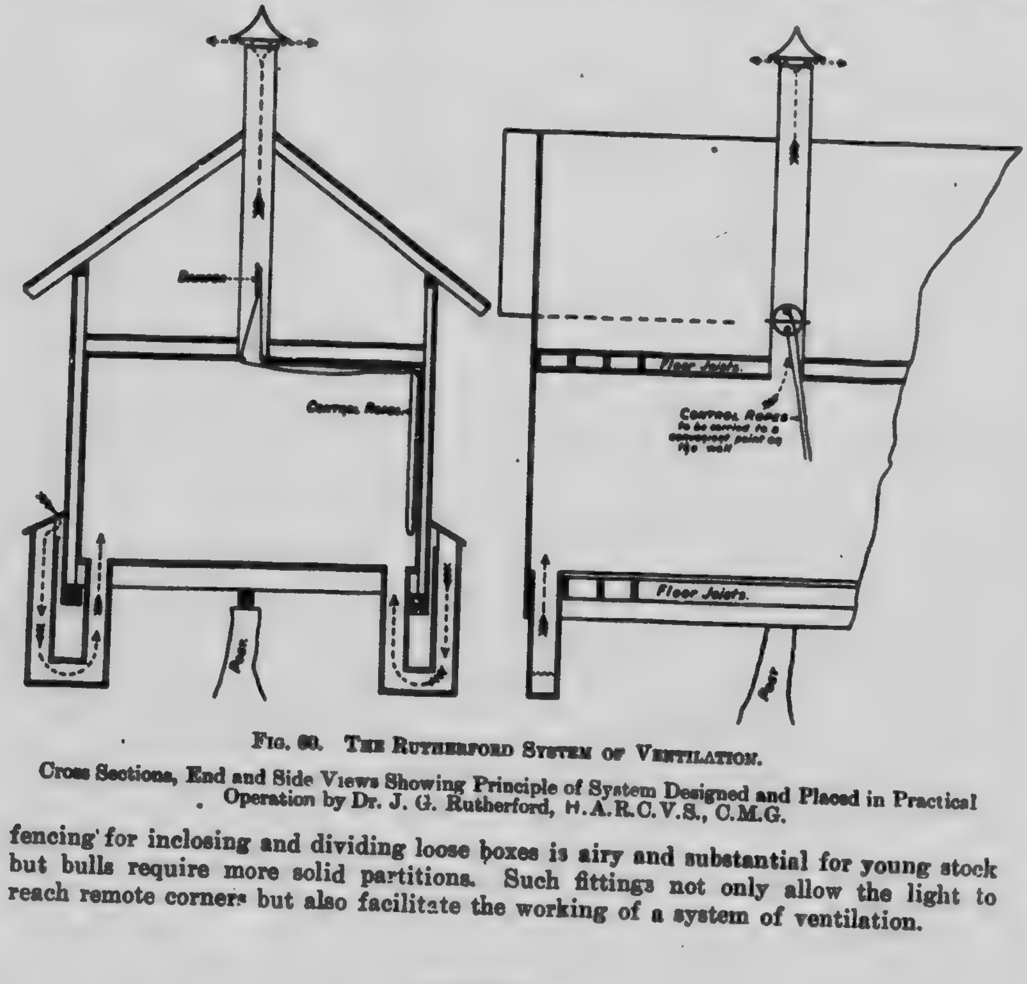

Damper
Control Rope
Floor Joists.
Control Ropes to be carried to a convenient point on the wall
Floor Joists.

FIG. 60. THE RUTHERFORD SYSTEM OF VENTILATION.

Cross Sections, End and Side Views Showing Principle of System Designed and Placed in Practical Operation by Dr. J. G. Rutherford, H.A.R.C.V.S., C.M.G.

Ventilation.

Many experiments have been carried out to test the value of ventilation, more especially with dairy cattle, but also to some extent with beef cattle. In a test conducted at the Wisconsin Experiment Station it was shown that dairy cows lost weight, gave less milk and drank more water while stable ventilators were closed as compared with similar periods while ventilation was provided.

The test was with 20 cows and lasted 14 days. Ventilation was provided for two days and withheld two days until the last period when the tests lasted three days each.

During each period of no ventilation each animal drank eleven pounds more water, lost fifteen pounds of weight and gave an average of ·55 of a pound of milk less per cow. They ate practically the same food under both conditions. The experience was the same for each period while the test lasted. At the end of the fourteen days the cows were turned out and, without an exception, every animal deliberately licked herself until not only the hair was removed in spots but sores were created. The itchiness was undoubtedly due to the overloading of the skin with impurities that could not be got rid of by way of the lungs. This kind of irritation and rubbing off the hair has been observed by every cattle feeder who houses his stock in warm, unventilated stables. Such a condition is never observed when stock are allowed the freedom of an open yard or have well ventilated quarters.

The cattle used in this experiment were vigorous milking cows, being well fed. They were accustomed to well ventilated stables. This, no doubt, explains the prompt response to the changed conditions; it also graphically indicates the evil effect of poor ventilation on animals even in healthy condition.

An experiment carried out by Mr. Grisdale at the Central Experimental Farm with beef cattle has even more valuable lessons for the Canadian cattle raiser. During one winter thirty head of steers were being fed in a building 35 by 42 feet, and without a system of ventilation. In another building, similar in every way to the former, except that it was well ventilated, was fed a similar lot of steers, taken from the same lot in the autumn. Both lots were fed and treated alike. In the spring it was found that the gains made by the steers in the poorly ventilated building were much less than those made by the other cattle. The actual difference amounted to a cost of about three cents per pound. The gains made by those in the poorly ventilated stable cost about 8½ cents per pound, while the others put on weight at a cost of 5½ cents per pound. Before the following winter a proper system of ventilation had been installed in the first building, and cattle were fed in both barns under the same system of feeding, with the result that both lots throve equally well, teaching the valuable lesson that it is a very expensive and wasteful practice to feed cattle in an unventilated building. This experience led to the installation of a good system into all the stock barns at the Experimental Farm.

An Approved System.

Contrary to the too general belief that windows can serve as ventilators, as well as to admit light, it may be pointed out that the best results are not secured unless a separate system of ventilation is provided in cattle barns. Ventilation by windows at times admits drafts and is too much influenced by outside temperature and the direction and rate of the wind. Various arrangements of sash to provide ventilation by windows have been tried but at the best without success. An independent system is needed, and that as simple as possible. A system that works under all conditions of wind and weather is what is required. Both inlets and outlets for the air are necessary and these should at all times perform the same functions. An inlet should always be an inlet and an outlet should never give trouble from downward currents.

For a number of years Mr. J. H. Grisdale has been experimenting extensively with various systems at the Experimental Farm. After giving practically all of the approved systems a comprehensive trial in both cattle and horse barns he has reached the conclusion that the 'Rutherford' system is the best. This system, invented a number of years ago by the present Veterinary Director General and Live Stock Commissioner; and found to work satisfactorily in the severe climate of Manitoba, is already fairly well understood. The principle upon which it works is that of the ordinary stove—the stable corresponding to the stove, the animals to the fire, the inlet to the front damper and the outlet for the foul air to the stove pipe or chimney. So long as the walls, windows and doors are fairly close, the animals raise the temperature, and cause the ventilators to work, and this in proportion to the requirements. That is to say, it is automatic in its action. The greater the number of animals and the closer the stable the more rapidly will the system operate. And this is what is needed, not only for purity of air, but for uniformity of temperature as well. In a close stable the degree of foulness of atmosphere corresponds with the temperature, as both are directly influenced by the radiation and breath from the stock.

Figs. Nos. 60, 61, 62 and 63 show the principle of the system. The air warmed by the cattle naturally rises and seeks an outlet. The outlet is necessarily at the ceiling and consists of a flue which passes through the roof. At the Experimental Farm the flues pass through an upper story. These should extend well above the building for the same reason that a chimney must do so in order to draw well.

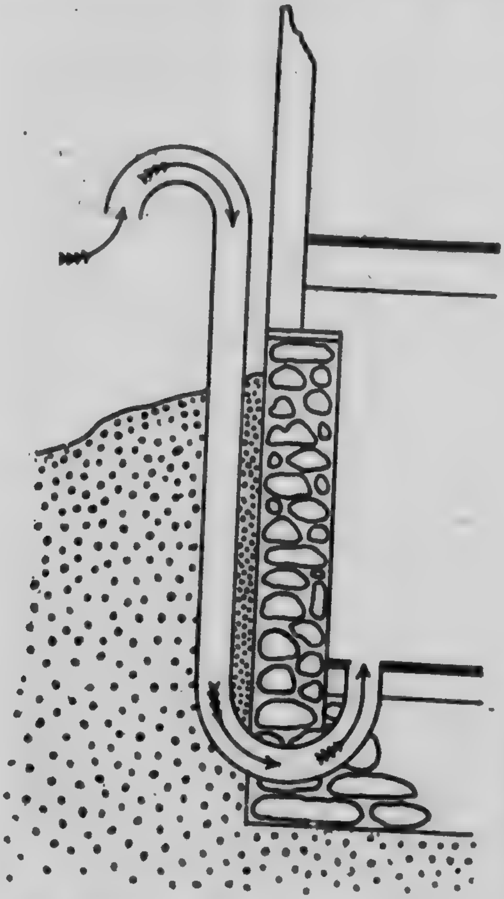


FIG. 61. SECTION OF WALL SHOWING PRINCIPLE OF INLET.

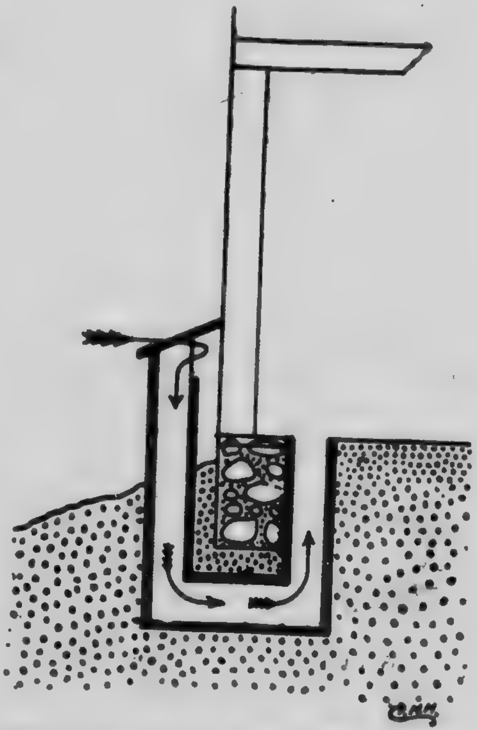


FIG. 62. SECTION OF WALL SHOWING FORM OF INLET USED AT THE EXPERIMENTAL FARM.

The inlets, it will be observed, enter the stable at the floor level. The inlet pipe is U-shaped and passes beneath the foundation wall. If the fresh air is taken from a covered shed the mouth outside may be near the ground level and be protected by a grating. If, however, the air has to be drawn from outside, more especially in districts subject to snow fall, the pipe should extend 4 to 5 feet above ground and the opening should be so arranged as to avoid the entrance of snow or rain, or undue influence from the wind. Fig. 62 shows the arrangement of the flue at the Experimental Farm barns. The roofed pipe is built against the wall, and the air enters through slots in the sides close against the building. The size of these openings corresponds with the capacity of the pipe outside.

The ventilator works by virtue of the natural tendency of warm air to rise. As the air warms it becomes foul, rises and escapes by the outlets. As nature abhors a vacuum the escape of the warm, foul air creates a suction of fresh air by means of the inlet pipes. Since the animals are constantly giving off warmth, the warm, foul air is constantly escaping and cold fresh air is at the same rate entering the stable, thus keeping up a gentle, almost imperceptible system of ventilation. To regulate the ventilation a damper is provided in this outlet flue. The closing of this also stops to a large extent the inflow of fresh air as the draught ceases stopping the suction. By the original system the inlet pipe enters at the floor level. This is to facilitate a steady, unobstructed, almost imperceptible flow of air through the stable towards the outlets. To guard against chaff, and dust falling into the openings, Mr. Grisdale, in the new cattle barn at the 'Farm,' raised the openings about four inches above the floor level. He claims that it works admirably. It is important that obstructions at the ceiling be reduced to a minimum. All beams and joists should be ceiled over. Even a very slight rise towards the opening facilitates the passage of the air. While for convenience it is often necessary to place the inlets along the side or end walls and the outlets at intervals along the centre of the building, the ideal arrangement would be to follow the stove idea in placing the inlets at one end at the floor and the outlets at the other end of the building at the ceiling. The warmed air would rise over the cattle, the outlets would draw it in one direction and that away from the inlet end. This would guard against the possibility of stagnant corners, or of air currents damming each other, and therefore insure a gentle, continuous movement of the atmosphere, with a corresponding purity of air and uniformity of temperature. At first thought it may be considered that a stable thus ventilated would be cold at the floor and warmer towards the ceiling. Contrary to this by actual tests with thermometers suspended at different heights it was shown that the temperature is practically the same at the floor as at the ceiling and at all intermediate heights.

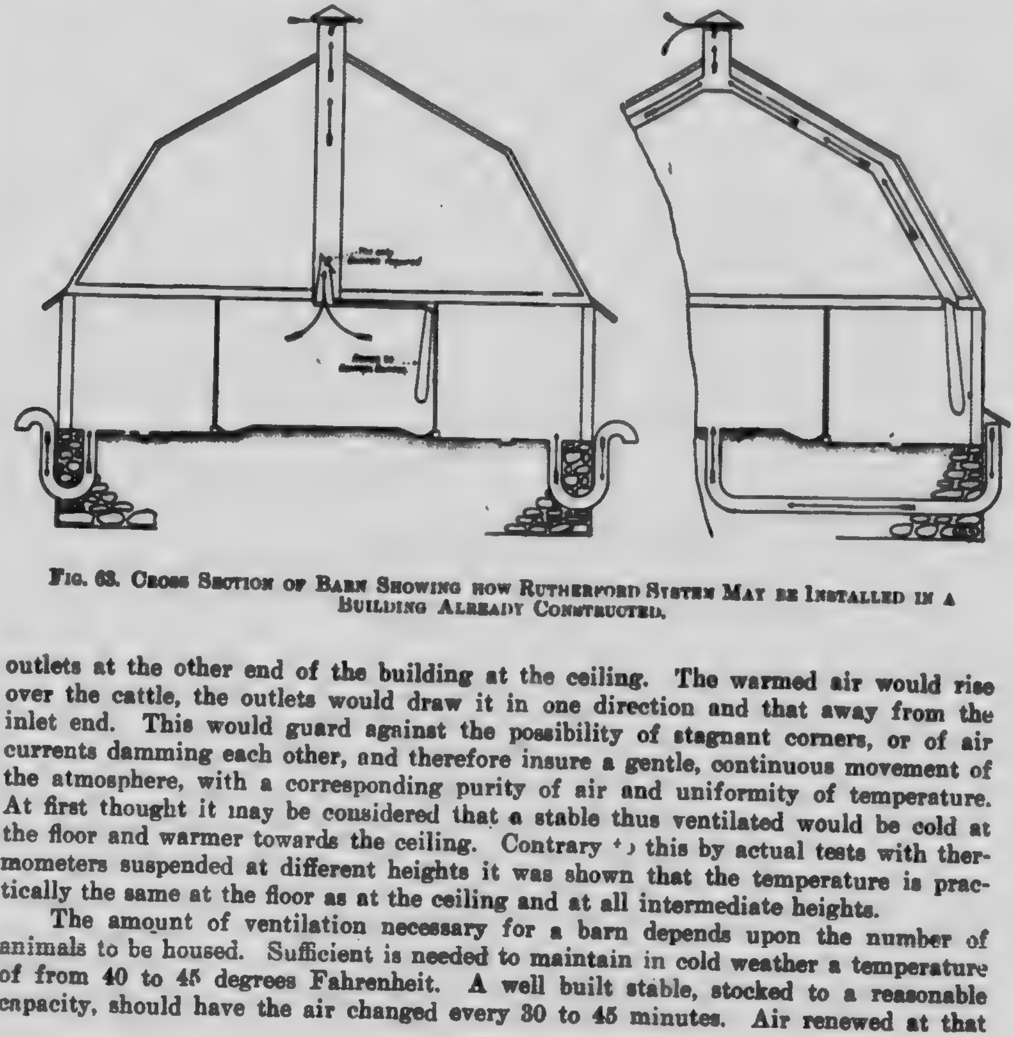


FIG. 63. CROSS SECTION OF BARN SHOWING HOW RUTHERFORD SYSTEM MAY BE INSTALLED IN A BUILDING ALREADY CONSTRUCTED.

The amount of ventilation necessary for a barn depends upon the number of animals to be housed. Sufficient is needed to maintain in cold weather a temperature of from 40 to 45 degrees Fahrenheit. A well built stable, stocked to a reasonable capacity, should have the air changed every 30 to 45 minutes. Air renewed at that

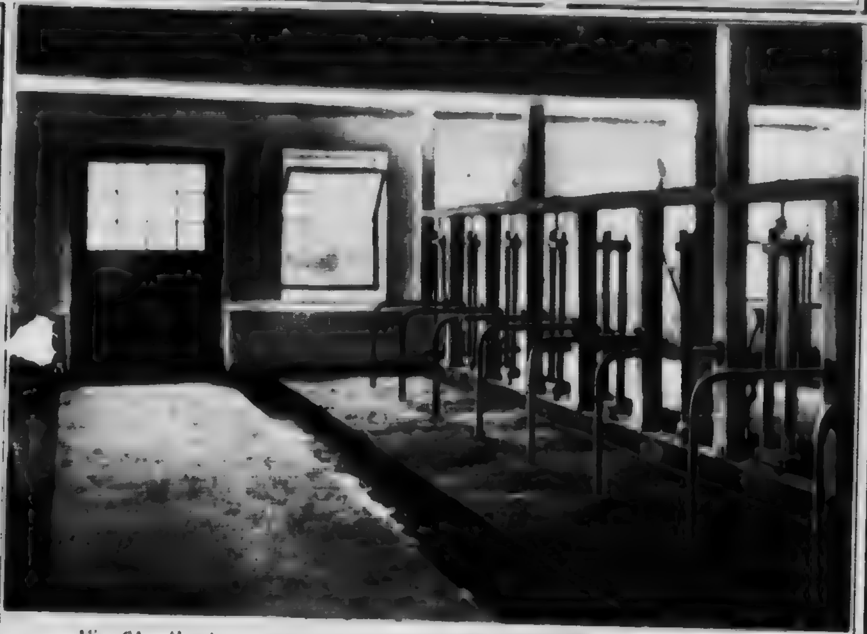


Fig. 64. Section of Interior Main Cattle Barn Central Experimental Farm. (Note provision for light and cleanliness.)

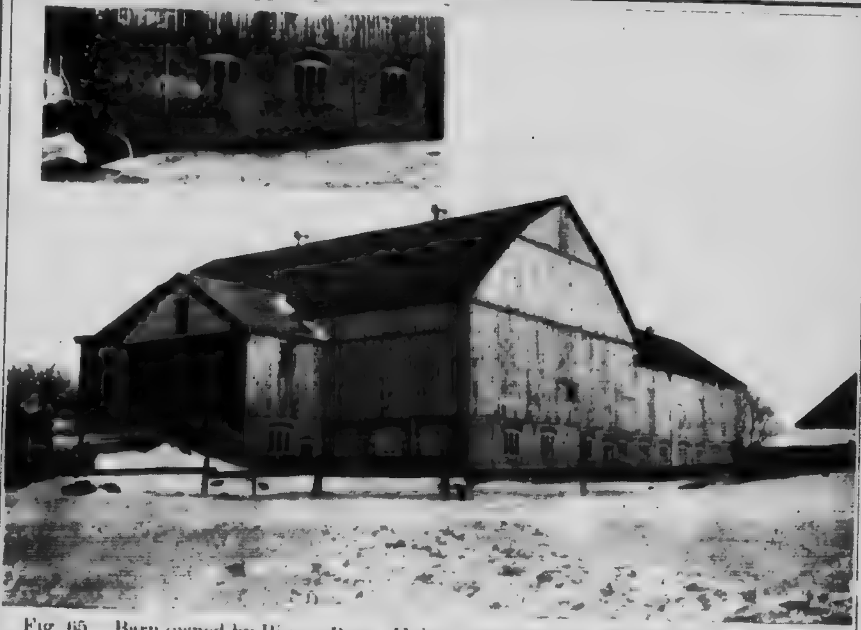


Fig. 65. Barn owned by Biggar Bros, Halton County, Ont. Section at upper corner shows windows, also galvanized metal intake pipes of ventilation system. Interior fittings same as Fig. 64.

rate will carry off the foul air as it is expelled from the stock; it will also remove the vapour, which, if allowed to remain, would condense on the walls and ceilings. Objection has been made to metal flues on the ground that they drip and freeze up. When moisture condenses on the inside of a flue it is evident that the ventilation is insufficient, allowing the air to become unduly moist. It is well, therefore, to provide pipes large enough to admit of being partially closed by slides, or dampers, should the number of animals inclosed be reduced from the maximum that the stable would accommodate. In addition it is well to cover the ventilating flue with building paper and a close fitting wooden box or covering. This is a safeguard against cooling and condensation.

The intake and outlet flues should be about the same in capacity, that is, provided the stable is tightly constructed. Because more or less air is sure to enter around windows and doors, the intake may be slightly smaller than the outlet. At the Experimental Farm this system is in operation in the main cattle barn in which the milking herds are housed, a bull barn, a barn for fattening cattle and a horse stable. The main cattle barn, 120 feet by 50 feet accommodates one hundred head. It has three outlets for foul air each 2 feet by 4 feet, and nine inlets for fresh air, each 3 feet by 10 inches. The fattening barn, 100 feet by 30 feet, which accommodates 50 head of steers has two outlets, each 2 feet square, and three inlets each 3 feet by 20 inches. The bull barn, 100 feet by 30 feet has three outlets about 3 feet square and three inlets each about 3 feet by 20 inches. The bull barn outlets, although considered too large, are stated to work satisfactorily under average conditions. The horse barn which accommodates twenty-five horses, has two outlets, each about 2 feet square and three inlets each about 3 feet by 18 inches. In all these stables the ventilation is good under all conditions of weather.

Convenience.

The cost of securing suitable labour renders it highly important that a cattle barn be arranged so as to save time and steps in tending the stock. This state of affairs has done much to make loose feeding popular. This question is discussed at length under another heading. Every cattle barn should have a number of loose boxes, at least for calves and yearlings, and it is well to make provision for housing loose, at least a portion of the fattening stock. Quiet, dehorned cattle about the same age undoubtedly do as well loose as tied and require much less labour in feeding and removing soiled litter.

The location of the feed room is of chief importance. This should be convenient to the supply of roots, grain feed and coarse fodder. Whether it pays to mix ensilage with other feed is a question that each feeder must settle for himself, and will depend much on the location of the silo. For a barn only wide enough for two rows of stock the best place for the feed room is the end, but for a barn 50 or more feet wide it is more frequently located about midway of the stable at one side, usually at the back. This location is convenient for putting down cut feed from the barn floor, and being in front of the driveway to the barn does not obstruct windows. Where this arrangement obtains, more especially when the barn has a side drive, it is better to place the silo at the end of the building in order to avoid obstructing windows.

The introduction of modern feed and litter carriers have done much to solve the labour problem in the stable. No barn is complete without this convenience, which renders the location of the feed room of less importance than before these were introduced.

Permanence.

The destructibility of wood, and the increasing value of this material, renders it necessary to avoid using it as far as possible for foundation or flooring purposes. Cement concrete is not only comparatively cheap but easily worked, not only for walls and floors but it is well adapted for mangers, etc. Iron inside fittings well put in, carefully selected roofing material and the liberal use of paint on the outside not only improve the appearance of a barn but add greatly to its durability.

A Good Cattle Barn.

Many good barns have been constructed during the past few years. Figs. 65 and 66 represent a modern structure owned by Bigger Bros., in the county of Halton, Ont. This firm rear and feed off beef cattle and took pains in designing this barn to meet their requirements. It possesses the essentials to an unusual degree in the matter of convenience, light, ventilation and durability.

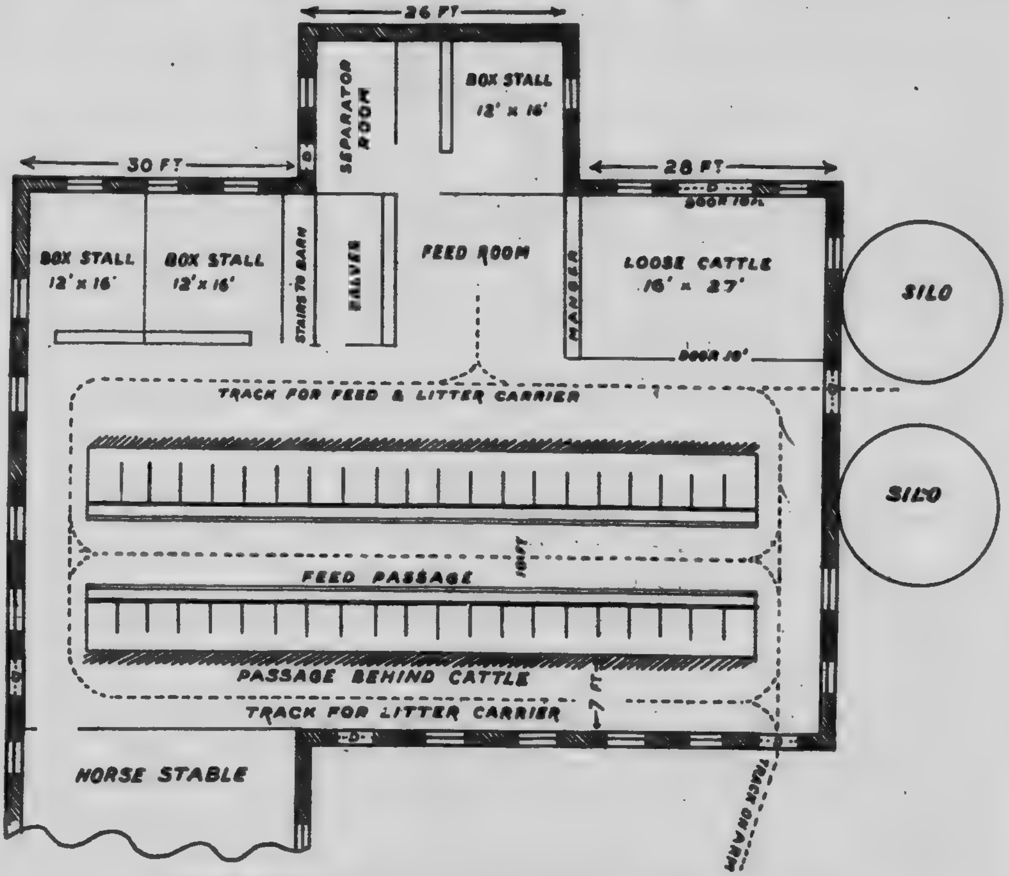


FIG. 66. GROUND PLAN OF CATTLE BARN OWNED BY BIGGER BROS.
Stalls and floor same as Fig. 64.

The barn is 56 feet wide and 84 feet long. As shown by the floor plan it accommodates two rows of tied cattle and a row of box stalls. It has 500 feet of over head iron track, including 40 feet on a swinging arm in the barn yard for conveying feed and litter.

The silage is taken direct to the stock instead of being mixed with other food in the feed room. The litter is conveyed outside and dumped in the yard or into a sleigh or wagon to be hauled direct to the field.

Fig. 64 shows the stall plan. The manger consists of a trough running along the side of the raised feed alley. The tied cattle are fastened with swinging stanchions. The barn has a complete water supply provided by windmill power. Each two head of cattle have a drinking cup between them. The stall partitions consist of iron piping set in the cement floor. As shown by the size and number of windows the stable is well lighted. The stable, 56 by 84 feet, has nineteen windows, and the horse stable, 30 by 60 feet, has thirteen. Each window has six panes, 14 by 18 inches. The centre sash is hinged and may be opened on warm days. These, however, are not depended upon for ventilation.

The 'King' system has been installed. By this system the fresh air enters at the ceiling and the foul air escapes by flues which open about four feet from the floor. Fig. 65 shows perpendicular metal pipes attached to the outside wall. These inlets are four inches in diameter and connect with glazed tiles, which pass through the wall. The outlets are four in number, and are placed two on each side of the feed passage. These are carried to the roof where they are continued between rafters, each pair meeting at a metal ventilator shown in Fig. 65 above the peak of the roof. These ventilators are so constructed as to avoid the possibility of down drafts. The outlet air shafts are constructed of double lumber with building paper between. This is to keep them warm, to prevent the condensation of escaping moisture, and consequent dripping or freezing up.

The barn accommodates 40 head of cattle tied in stanchions and 16 head loose, besides two box stalls for calves. As shown it also has a feed room and a separator room and box stalls for roots or stock beneath the double driveway. Two circular silos stand at the east end. The stable walls are ten feet 2 inches high inside. The corner and side posts of the barn above are 18 feet long. As far as possible all doors slide on rollers. When visited on a severely cold winter day the temperature of this stable was about 45 degrees Fahrenheit, the atmosphere was fresh, stock comfortable and contented, and their skins were apparently in a healthy condition.

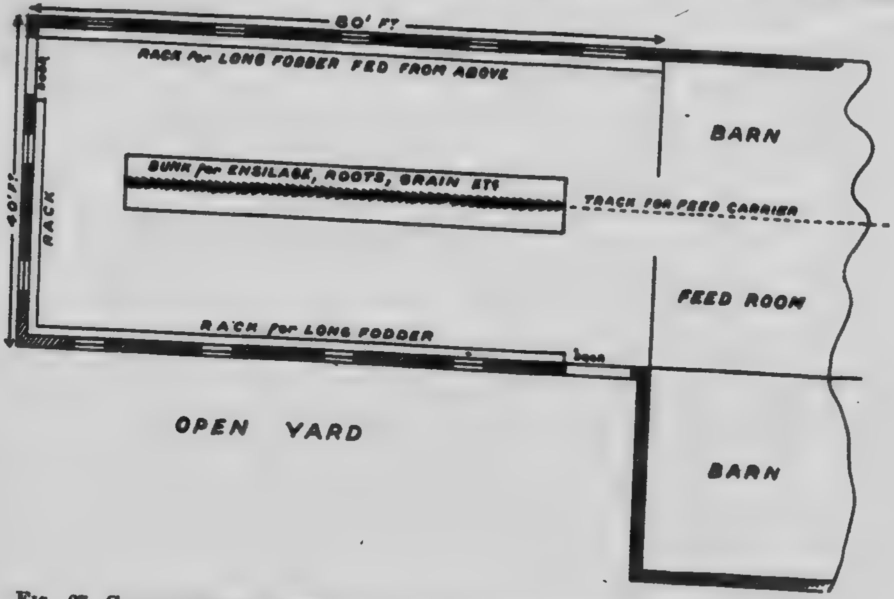


FIG. 67. GROUND PLAN OF SHED FOR LOOSE FEEDING, OWNED BY GEO. P. BARRIE.

Shed for Loose Feeding.

In the section of this bulletin dealing with finishing beef cattle reference is made to the shed used, and system of feeding adopted by Geo. P. Barrie, near Galt, Ont. Fig. 67 represents the ground plan of Mr. Barrie's feeding shed. Above the shed is a feed loft connected with the main barn from which hay and other fodder are supplied to the racks against the walls for the cattle. The walls are of inch lumber lined and battened. The large door at the side is opened in the morning, allowing the cattle free access to the open yard until night. The walls, windows and ceiling admit of sufficient ventilation to prevent the temperature rising too high during the night, and, since the cattle of their own choice remain out of doors most of the day, this style of shed may be counted a success. In addition to being sanitary, comfortable and convenient to work in, it has the other important feature of cheapness of construction.

MARKETING.

The market is the objective point of every live stock feeder. Unless one can see a return for his outlay and labour, he is not likely to continue fattening cattle. Fortunately there are consumers awaiting the beef, and since it is impracticable for the feeder to kill his cattle and prepare the meat for the urban dweller, and as the urban dweller cannot profitably go to the country for his cuts of meat; markets, abattoirs and shops have been brought into existence. Markets are thus a necessary part of the beef trade of every advanced country; and, the more valuable the live stock industry, the better the marketing arrangements. Beef raisers in certain sections may become justly impatient because of delay in providing marketing facilities; but, as the industry developes, well-organized markets naturally come into existence to meet the needs of both buyers and sellers. So long as a country produces chiefly dairy products, or principally wheat, the markets for beef cattle are sure to be slow in coming. But let the beef cattle industry grow and markets to take care of the supply are sure to come. They have come in the beef-raising provinces of Canada, and are year by year being extended and improved. In Toronto, Montreal, Winnipeg, and at other places, vast sums of money have been invested in fitting up yards and buildings for the selling and buying of stock. At these points, on certain days each week, buyers are on hand looking for stock and ready to pay for it according to values determined by the law of supply and demand. When the supply is short, the feeder has little difficulty in finding a buyer for his finished bullocks. During the past two seasons, owing to almost continuous good markets, many cattle have been coaxed away from their owners before they were fit to be marketed. Country buyers have been more insistent than usual, which has augured well for the cattle raisers, so far as the immediate price is concerned, but it has reduced the out-put of good cattle. To find a market has not been a serious problem to the man in a district where cattle of good quality are produced. Fortunately during the past season comparatively few periods of bad market conditions have been encountered. This has had an excellent effect on the trade. A well known general shortage prevented serious slumps, and confidence in the industry has been the result.

While keen competition for stock continues, the marketing problem will take care of itself fairly well for the man who keeps in touch with values by reading market reports and by paying occasional visits to the larger stock yards. The time will come, however, when supplies will reach a more normal condition, and then the country drover may neglect to make his weekly or monthly rounds. It is well, therefore, to do a little experimenting in patronizing the big markets. It seldom pays a feeder with only a few head to undertake to sell his own stock, although there is no reason why a bright fellow should not, after some experience, make as good a bargain as any one else. A man with a car load often sells; but, as a rule, it is more satisfactory to select a good commission firm, and consign stock to them. Many drovers deal with these men, knowing that they are in a position to get the last dollar for the stock. It is the business of these firms to find markets, and they must, of necessity, keep in close touch with all available outlets. They learn the requirements of exporters and butchers, and are always ready promptly to dispose of cattle of whatever class which may be consigned to them. Through these men many half-fat cattle find their way back to the country to be finished.

Just when to market cattle is a serious problem. While the good ones well finished always sell most readily and at highest price per pound, it is not always expedient to hold cattle until ripe for the best trade. One's supply of rough fodder must be a strong factor in deciding a matter of when to sell. It may or may not pay to buy concentrated food, but it seldom pays to purchase roots, hay or ensilage for beef making. Feeders, after considering the age, quality, and condition of their cattle, should decide, when putting them on a fattening ration, how long they should be fed, and then feed and market them accordingly. It is safer to do this one year with another than to follow the policy too often pursued of getting the cattle ready and then waiting for the market to become satisfactory. In times of normal supply too often the consequence of such a policy is a heavy run of stock and a serious drop in values just at the wrong time.

There are shippers in most beef-raising localities anxious to buy good cattle from old customers at a fixed price to go at a stated time. Many Christmas, Easter and May cattle are sold in this way. One must decide from his own judgment and experience whether it is better to sell in this way or ship to a commission firm when the cattle are ready. Neither plan is always better than the other. It is a fact, however, in so far as Ontario is concerned, that more and more export cattle are bought in Toronto instead of at the farms, as was the rule years ago. Exporting firms, that a few years ago had buyers going about the country, have withdrawn them, and now depend on the cattle coming to them at the Stock Yards.

It is the privilege and in fact, almost the duty—of the man who has cattle to sell to keep himself informed upon the condition of the market. He can do this by the market report, and by telephonic communication with his dealer; and, in addition, he would do well to visit the market from time to time to see how trade is carried on, the relative value of cattle of different classes, and make the acquaintance of men in the business. There is much valuable information a feeder can pick up during visits to a large market, especially if he accompanies a shipment of his own feeding with the purpose of interesting buyers in him and his cattle.

Grades of Cattle.

In a market like Toronto, Montreal or Winnipeg, cattle are graded as exporters, butchers, stockers, feeders, and canners. Butchers are subdivided into Nos. 1, 2 and 3. Exporters are not necessarily better finished, or worth more per pound than butchers, but they are usually a bit larger and heavier. A strong, fleshy bullock stands the shipping well, dresses out a good weight of beef, and it costs no more for ocean freight for a large animal than for a small one. Heavy exporters go chiefly to London, Liverpool and Glasgow, while many less heavy steers are taken to Manchester. Buying for this latter market is creating a competition for butcher's stock to the advantage of the seller. While there is still a large but decreasing number of unfinished grass cattle, more particularly from Western Canada, and known as 'ranchers,' exported to Great Britain, the great bulk of exporters are of good to choice quality, and weigh from 1,200 to 1,500 pounds. The selling value is more a matter of finish than weight. Top-priced steers exhibit a well-bred appearance, and carry sufficient flesh and fat to dress out from fifty-five to fifty-seven per cent of carcass.

The majority of cattle, exclusive of feeders and stockers, sold on Canadian markets belong to the butcher class. These are valued largely according to condition as regards finish. They are usually younger and smaller than exporters, and those of No. 1 class are quite as well finished and usually bring as much a pound. A 1,200 pound bullock that will dress out fifty-eight or more pounds of carcass to the live hundredweight will command a premium over the quotation for No. 1, which dresses out a smaller per cent of carcass. At no season of the year is the percentage of this class large, and this keeps up the price. From Christmas to June the supply is most generous, but during the remainder of the year grades two and three are by far the most common. No. 2 cattle are less well finished, dressing fifty-two to fifty-four per cent, while No. 3 includes thinner stock and lower grades, often showing dairy form and colours. Most butchers' cattle are slaughtered in the cities where sold, although a good number of cars go out from Toronto during the year for Montreal and intermediate points. In this age of large abattoirs and refrigerator cars, many towns that years ago were supplied by beef killed at home now depend on the large meat companies in Toronto and other points for their supply. This condition is centralizing the trade and building up yards, and improving facilities whereby buyers and sellers are brought together to deal in a thoroughly businesslike manner.

Stockers and feeders include calves, yearlings, two-year-olds, and older cattle that are to be sent back to the country for further feeding. Each is graded according to age, quality and condition. The younger class, usually weighing from 500 to 800 pounds, and known as stockers, are frequently bought to keep a year or more before they are ready for beef. Feeders are not only older and larger than stockers, but are, as a rule, better fleshed. Feeders under 900 pounds are not as popular as heavier cattle, and many bullocks more than half fat, that would make fairly good butchers' cattle are preferred, more especially in spring, to finish on grass for the June or July market. While such cattle cost high prices, if well bred and thrifty, they put on weight rapidly—forty to sixty pounds a month—and come back No. 1 beef, usually for export.

Preparing Cattle for Shipping.

It pays to prepare cattle for shipment in order to reduce as far as possible shrinkage during transit. Grass cattle should be yarded for a couple of days, and fed hay, preferably timothy, and if grain has been fed the ration of this should be reduced. A few day's feeding on dry oats, about five pounds a head, is recommended by good cattlemen. Water should be allowed constantly until the morning they are to leave the farm, and care should be taken to drive them leisurely to the station. This method will reduce scouring and shrinkage to a minimum.

Shippers need never load cattle into dirty cars. The law compels railroad companies to clean all cars before sending them out. Cars should be bedded with straw, sawdust, sand or other material, that will prevent the cattle from slipping or becoming sore. The expense of bedding the car must be paid for by the shipper. Cattle cars vary in size, and are charged for according to their length. It pays, therefore, to fill the car well, as no rebate is made for underweight, although extra weight is liable to be charged up to the shipper. Cattle ship better when fairly tight in the car, more especially if they are, as they should be, of about uniform size. A good load for a 36-foot car is from eighteen to twenty head. If the cattle are to be on more than twenty hours it is well to put 200 to 300 pounds of good hay in each car. If the car is not provided with racks, the hay should be strewn along the sides and ends where it is least liable to become trampled under foot.

Cattle that have been properly prepared and comfortably shipped will reach the market in a normal state ready for a drink, which will, with a good feed of hay, put them in attractive condition for the buyer. An excessive fill on the market is often detrimental to a good sale, as buyers detect such a condition, and are apt to neglect cattle so filled until late in the day, when they may have commenced to scour, lose weight, and look mean. Feeding grain in excessive quantities to cattle on the market is an unwise practice, and should be condemned. To secure weight by this method became a common practice on the Toronto market, until in February, 1910, when buyers issued a notice in which they jointly pledged themselves to refuse to buy cattle, which after arrival on the market, had been given any other feed than hay and water.

THE PRINCIPLES OF FEEDING.

A feeder may place in his stables or feed lot, lean cattle of excellent type and have stored in his barns food of the highest quality and yet fail to profitably turn out high-class beeves at a profit. That is to say he may administer the food in such a way as not to secure an adequate return for the food consumed. The successful feeder requires experience and when to this is added, either from his experience or the teaching of others, an accurate knowledge of the principles of animal nutrition he is well fortified to manage a stable of fattening cattle.

It is interesting to know something about the general composition of the body of farm animals. The amounts of water, nitrogenous matter, fat, etc. in a large number of animals have been determined by experiment stations and some of the general deductions which have been arrived at from these analyses will be given. In farm animals it is not uncommon for half the body to be composed of water. This proportion is largest in young animals, and as age advances the tendency is for the proportion of water to become less. During the fattening process the proportion of water in the body is reduced. Of all the solid constituents present, fat generally occurs in largest proportion, and this proportion increases very greatly during fattening. In the case of a fat bullock, fat might form about one-third of the carcass. The nitrogenous matter amounts to from 10 to15 per cent, and although its proportion tends to increase as the animal gets older, yet during the fattening process the proportion diminishes on account of fat being laid on at a greater rate. The ash of the animal body, or that which remains after the animal body is burnt, is very small, amounting only to about 3 or 4 per cent. The animal with the largest proportion of bone contains the largest proportion of ash constituents. It might therefore be roughly stated that a fat bullock is made up of about one-half water, one-third fat and one-sixth nitrogenous matter.

It is important to know the nature of the increase in young animals as compared with old, because here lies an explanation of the economy in early maturity. In the case of young animals, the increase consists largely of water and lean meat, while in the older or mature animals the increase is largely fat, and is of a drier nature. Thus it is that older animals are not so economically fed as younger animals; the higher proportion of lean meat in the increase of young animals is altogether in their favour.

In the case of the living animal there is constant demand for renovation of tissue, and, and in the case of fattening animals, for the production of increase; the heat of the body must be kept up, and energy is required for mechanical work. All these results are obtained from the food consumed and appropriated by the animal.

The solid parts of food are conveniently divided into albuminoids, fats, carbohydrates, and salts. These all have distinct functions in the animal body. The albuminoids contain nitrogen, carbon, hydrogen, oxygen and sulphur, combined together in complex fashion. These when consumed by the animal, and after being digested form the albuminoids of the animal body—hair, wool, horn, etc., are also produced from the albuminoids. In some cases fat may be formed from them and body heat and mechanical force may also be developed. Although fat, body heat, and mechanical force may be supplied by the consumption of albuminoids, it is advisable to let this part be supplied by the fat and carbohydrates, and preserve the albuminoids more for flesh formation. The power of albuminoids to form flesh (lean meat) hair, wool, horn, etc., is quite unique, as none of the other ingredients of the food have this power.

The fats in the food, after being digested and taken into the circulation, may be stored up as fat in the body, or, they may supply heat and mechanical energy to the

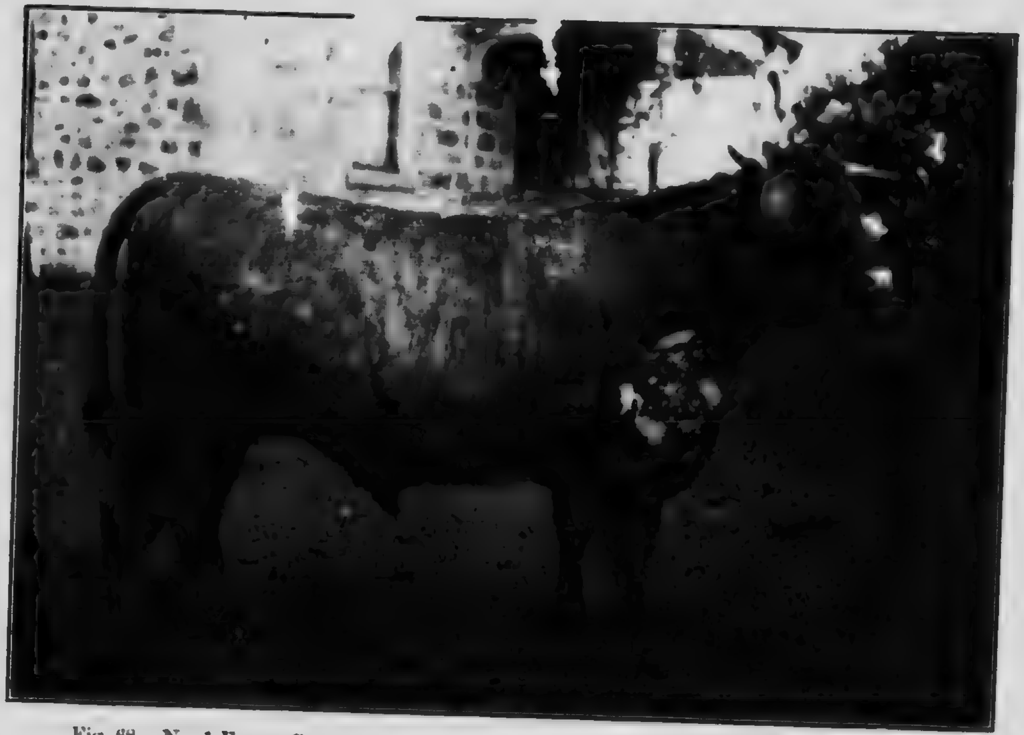


Fig. 68. No. 1 Export Steer, two years old. Weight, 1,400 lbs. Estimated dressed weight, 812 lbs., or 58 per cent.

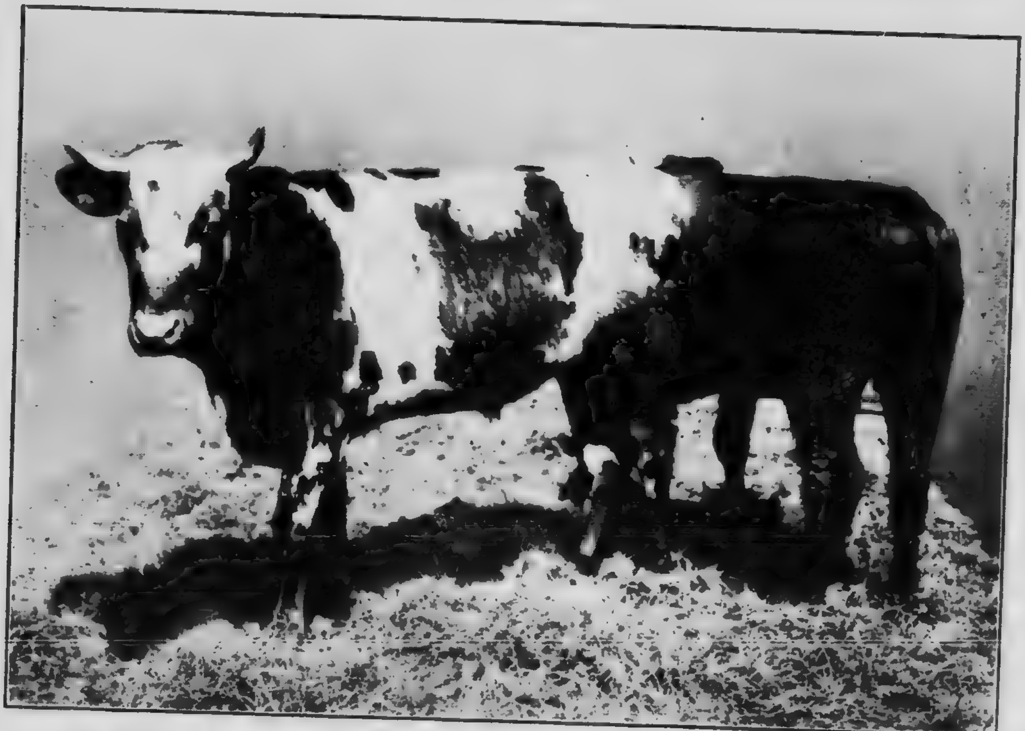


Fig. 69. No. 2 Beef Cattle. Live weight, 1,780 lbs. Dressed weight, 943 lbs., or 53 per cent. of live weight.

32—p. 96

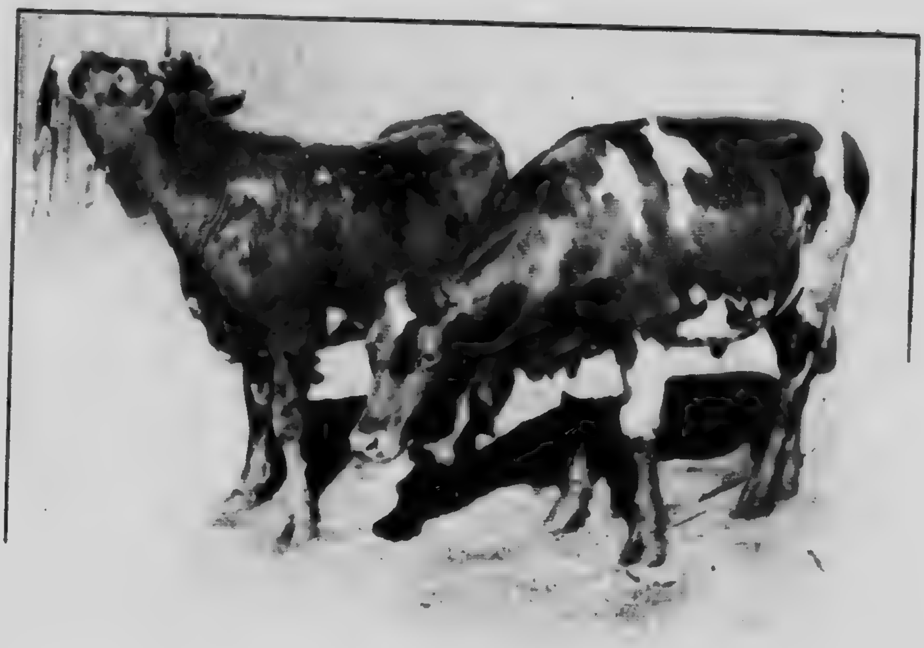


Fig. 70. No. 3 Beef Cattle. Live weight, 1,750 lbs. Dressed weight, 870 lbs., or 50 per cent. of live weight.

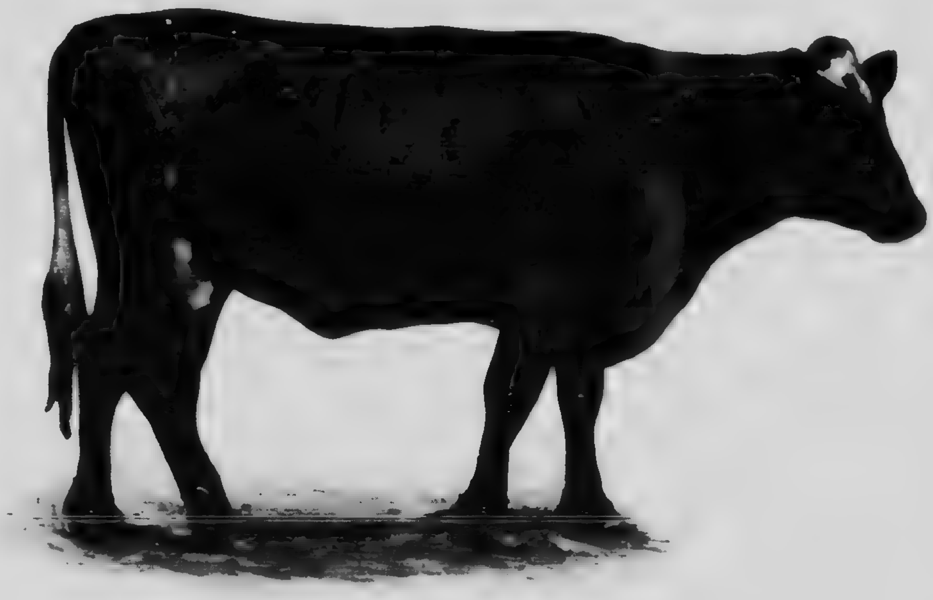


Fig. 71. A Good Butcher Heifer. Would dress about 53 to 54 per cent.

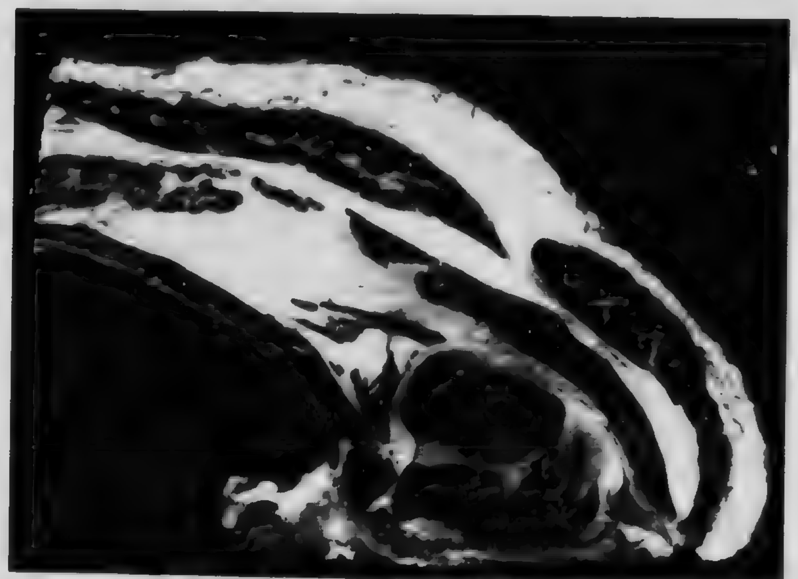


Fig. 72. Rib Roast from an International Champion Steer.
Total weight (four ribs), 30 lbs.; bone, 4 lbs. 4 oz.; meat 24 lbs. 6 oz. Meat of superior quality.

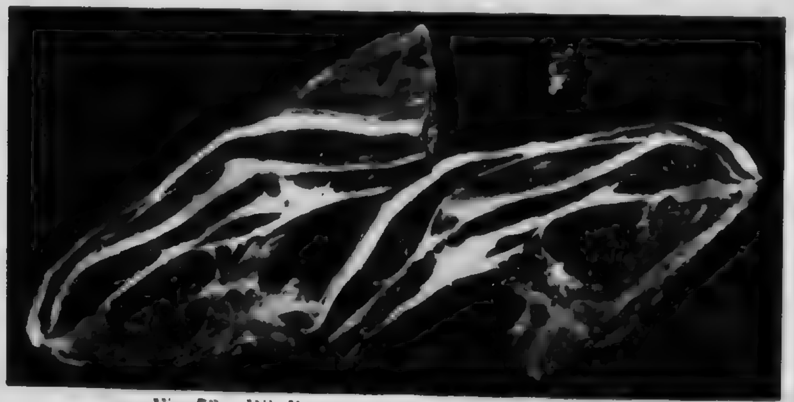


Fig. 73. Rib Roasts from Steers shown at Fig. 69.
Total weight (four ribs), 20 lbs.; bone, 5 lbs.; meat, 15 lbs. Meat of good quality.

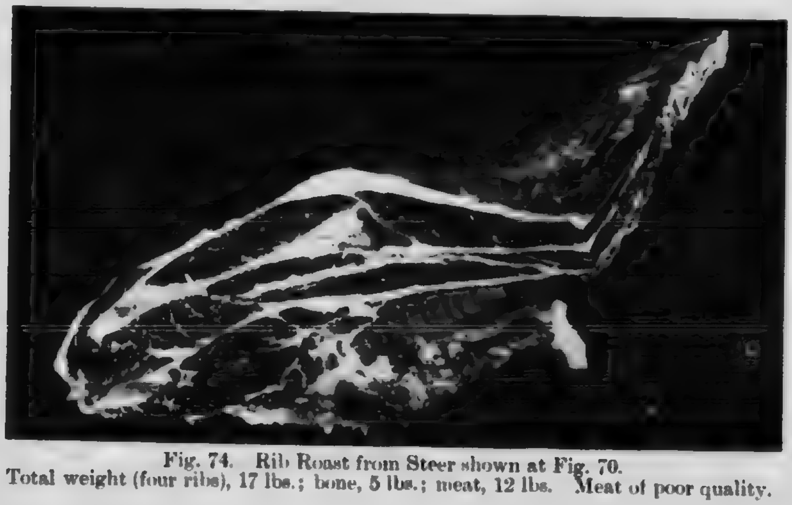


Fig. 74. Rib Roast from Steer shown at Fig. 70.
Total weight (four ribs), 17 lbs.; bone, 5 lbs.; meat, 12 lbs. Meat of poor quality.

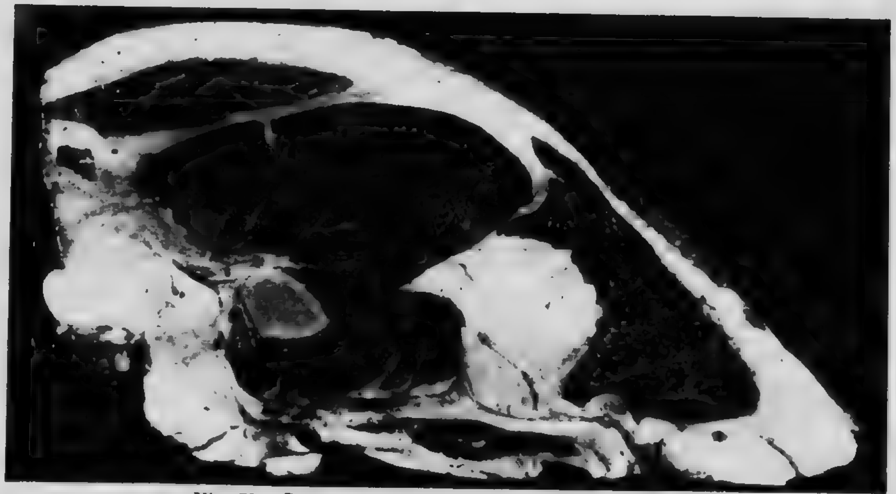


Fig. 75. Loin cut from International Champion Steer.
Total weight, 40 lbs.; bone, 4 lbs. 8 oz.; meat, 35 lbs. 8 oz. Meat of superior quality.

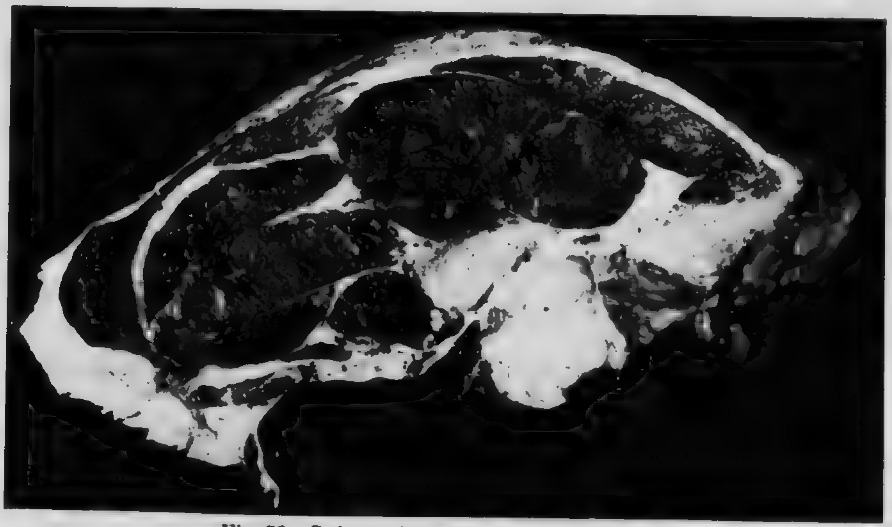


Fig. 76. Loin cut from Steer shown at Fig. 69.
Total weight, 30 lbs.; bone, 5 lbs.; meat, 25 lbs. Meat of good quality.

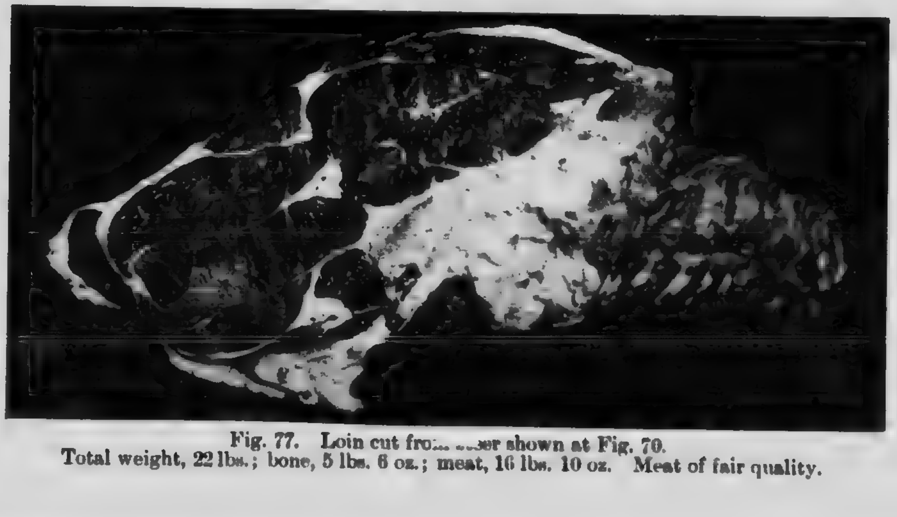


Fig. 77. Loin cut from Steer shown at Fig. 70.
Total weight, 22 lbs.; bone, 5 lbs. 6 oz.; meat, 16 lbs. 10 oz. Meat of fair quality.

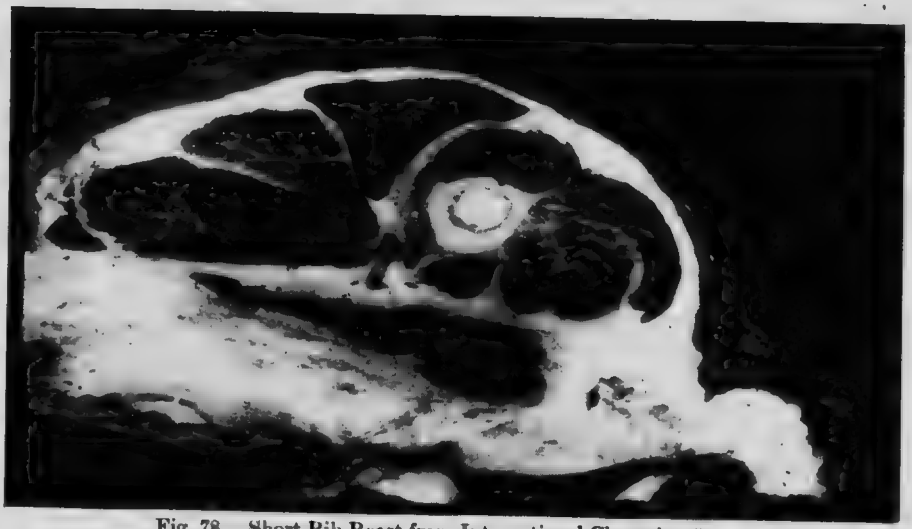


Fig. 78. Short Rib Roast from International Champion Steer.
Total weight, 60 lbs.; bone, 11 lbs.; meat, 49 lbs. Meat of superior quality.

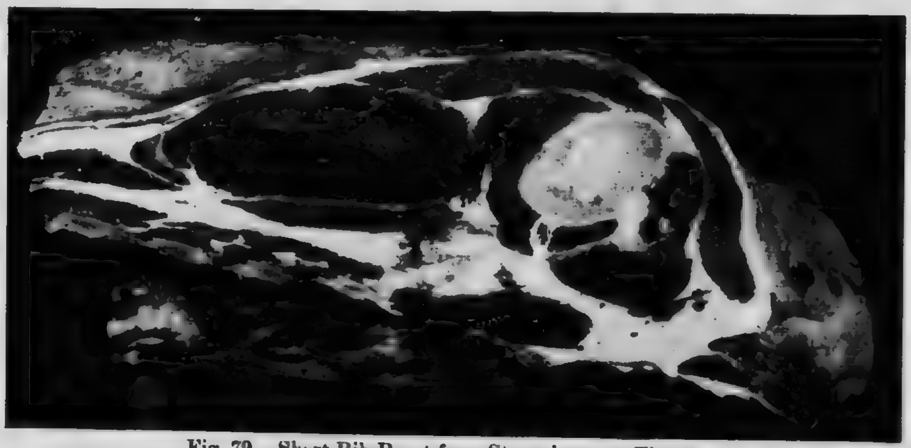


Fig. 79. Short Rib Roast from Steer shown at Fig. 69.
Total weight, 40 lbs.; bone, 12 lbs.; meat, 38 lbs. Meat of good quality.

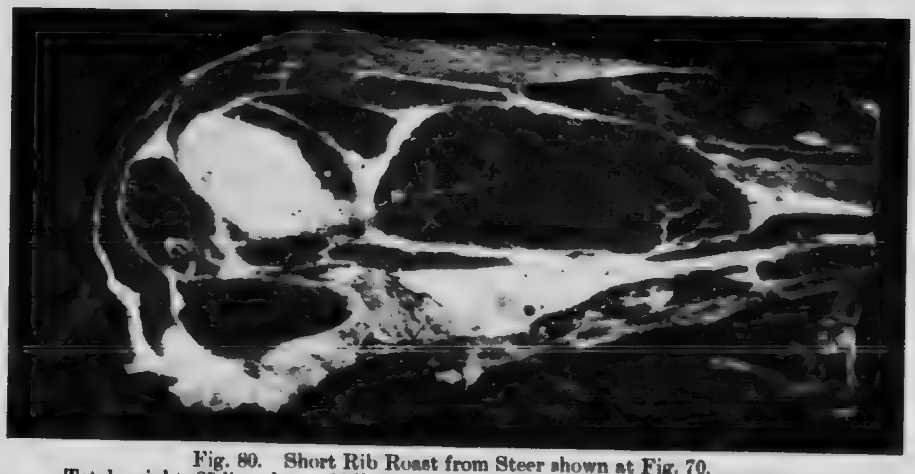


Fig. 80. Short Rib Roast from Steer shown at Fig. 70.
Total weight, 35 lbs.; bone, 12 lbs. 8 oz.; meat, 22 lbs. 8 oz. Meat of poor quality.

system. As a heat and force producer fat has a higher value than carbohydrates. The fats in the food contain only carbon, hydrogen, and oxygen, and are quite incapable of adding to the nitrogenous tissues of the animal.

The carbohydrates, like the fats, contain carbon, hydrogen, and oxygen. These when taken into the circulation supply the animal with heat and energy capable of doing mechanical work. If fed in excess they may produce fat. The great thing is to have them present in the food in sufficient quantity to supply the body requirements of heat and work, and thus prevent the albuminoids from being used for this purpose. The salts in the food enter into the composition of bone, etc.

After learning the functions of the different constituents of foods, a brief account of the process of digestion will show how the food becomes absorbed into the circulation. In the case of the bullock the food is swallowed and remains in the paunch or first stomach for a time to soften and become mixed with the juices contained in it, then the food is thrown back into the mouth and chewed as cud. This chewing has the effect of mixing the food with the saliva, and gradually converting the starchy part into sugar by the action of a ferment in the saliva called ptyalin. The food now more or less fluid in character passes along into the fourth stomach, or the true digestive stomach, and mixes with the gastric juice secreted by it. This acts on the albuminoids and converts some of them into soluable bodies called peptones, by the action of a ferment called pepsin. Passing into the small intestines the bile attacks the food, and acts chiefly on the fat; and to complete the work the pancreatic juice acts on the carbohydrates, fats, and albuminoids, rendering a large proportion of the food soluable. The dissolved or digested portion is absorbed into the circulation largely through the walls of the small intestine and is carried by the blood to all parts of the body where the different ingredients perform their respective functions. The heat in the body is produced by the oxygen of the air passing into the blood through the lungs and combining with the fats or carbohydrates in the blood. This combination or chemical change which takes place results in heat being generated and the animal body being warmed.

The value of a food is largely determined by four principal characteristics as follows: (1) Analysis or chemical composition; (2) Its digestibility; (3) Its palatability; (4) The purpose for which it is intended.

It has been pointed out that the important constituents of a feeding stuff are albuminoids, fat or oil, and carbohydrates. It is important to know to what extent these are present and in some cases it is also an advantage to know the percentage of fibre also. As to the relative value of albuminoids, fat, and carbohydrates, this varies according to circumstances. For the production of heat in the animal body oil would be about 2½ times as effective as either albuminoids or carbohydrates; while as a 'flesh former,' albuminoids alone would be effective. Although albuminoids may also give heat and force it is economical to prevent this as much as possible by using fat and carbohydrates in addition. In fact, each of these three ingredients has distinct functions, and should all be included, the important thing being to include them in suitable proportions. If relative values were allocated it would be approximately correct to give albuminoids and oil 2½ times the value of carbohydrates.

Digestibility.

The chemical composition alone may be no sufficient guide as to whether the ingredients are present in an easily digestible form, but the origin of the feeding stuff generally gives us some enlightenment on this point. Where a food is derived from a ripe or matured seed such as cereal grains, linseed, cotton seed, etc., the composition, as well as the digestibility will not vary seriously. It is foods rich in fibre, such as hay and straw which have generally to be watched. With hay and straw crops the ripeness at cutting time has a great effect—the riper it gets the larger is the proportion of fibre in the food, and this at the expense of the more valuable ingredients.

Palatability.

It is highly important that a food should have an agreeable smell or flavour which causes the animals to eat it with relish. This is a value distinct from composition or digestibility. It excites the appetite and causes the animal to eat it eagerly. It also increases the flow of digestive juices. In some cases a food palatable to one animal may not be to another. The employment of some condiment or appetizer may be useful either where the animal has lost its appetite or the food has been slightly damaged. The value of these condiments is generally due not so much to the composition as to the possession of a particular odour or flavour.

A successful feeder knows the importance of having a food which passes through the animal system at a rate which is neither too fast nor too slow. Food which passes through too quickly is not likely to be so well digested as it would be if it passed through more slowly although it would be equally undesirable to have it passing too slowly. Certain foods have the power of regulating the rate of passage of the food, and on this account have a special value. These may be divided into laxatives and astringents. Some of the best laxatives we have are roots, grasses and oilcake, while very important astringents are straw and cotton seed meal. Good mild astringents are crushed oats and wheat bran. Then, again, where the basal ration is poor in any particular ingredient, the addition of a food rich in that ingredient balances the food, and often gives results greater than its composition would indicate. In addition, it would also be necessary to see that the food was in good condition.

In a bulletin of this character it is not practicable to enter into an elaborate discussion of the principles of feeding. In the foregoing sufficient has been stated to indicate something of the nature of foods usually fed to cattle and the principles of digestion and assimilation in the animal body. Those interested in a further study of the scientific side of the subject would do well to secure an authentic treatise such as 'Feeds and Feeding' by Henry; 'Feeding Farm Animals' by Shaw; 'The Feeding of Farm Animals' by Jordan; 'Profitable Stock Feeding' by Smith; 'Beef Production' by Mumford; or 'Feeding Animals' by Stewart. Such works are procurable from any bookseller or they can usually be obtained from the publishers of Agricultural Journals.

DEHORNING.

Cattle as now reared and cared for are better without horns, which have come to be regarded as harmful appendages and useful only to the extent that they improve the appearance of animals wearing them. Many years ago cattle raisers conceived the idea of protecting the weaker animals from the stronger and vicious ones by removing the points of the horns or attaching brass knobs. Towards the end of the past century the entire removal of the horns became general practice in many sections. The success of this system, which has greatly simplified the tending and housing of cattle, has left no ground to stand on for those who would prevent the operation from a humane standpoint. Careful observation and investigation have demonstrated clearly that suffering caused by the operation on even mature animals is trivial as compared with the damage that even one mean old cow frequently commits on the other members of the herd in the field, the yard and at the watering trough. Before the advent of the practice of dehorning to house loosely horned cattle that were more than a year old was inexpedient whereas dehorned cattle of any age are run together at all seasons of the year with as little risk from injury from each other as sheep cared for under similar conditions. And yet dehorning is not as general as it ought to be. One feeder living in a remote district argues against loose feeding on the ground that the cattle would hook each other. To remove the horns from a pure bred herd of which the owner is justly proud might well be considered wanton disfiguration, but, to preserve intact the defensive appendages of a bullock is at least of doubtful wisdom.

Cattle are most easily dehorned during calfhood. Caustic potash is the usual agent employed while Gillet's lye does a satisfactory job. The action of these agents when properly used is to destroy the life of the horn in its early stage rendering the treated animal a smooth headed beast, deprived not only of the instruments of defence, but to a large extent the inclination to bully its mates. Dehorning by potash or lye is done before the animal is ten days old or as soon as the button-like embryo can be located on the calf's poll. The hair surrounding the spot is clipped off and the parts moistened with soapy water. When using the potash in the stick form it should be wrapped in paper to protect the hand and an exposed end moistened and rubbed gently on the buttons in turn for about five minutes or until they become sensitive and red but not to the extend of bleeding. Care must be taken that the dissolved potash does not run down the side of the head, or the skull may be seriously burned and permanently disfigured. If carefully done a scab soon forms, healing follows and the spot becomes covered with hair from the surrounding part. With some calves the operation may be done at four or five days of age while in others it is necessary to defer the operation for a few days longer. If treatment has been neglected until the calf is two or three weeks old the horns may yet be killed with Gillet's lye. The preparation of the horn is the same as for caustic potash. The powder is moistened and worked into a paste which is applied and rubbed well in with a knife blade or piece of wood. It is a safe practice to apply grease or oil to the skin around the horn to protect those parts from the action of the lye, but no oil should touch the part to be treated. The calf dehorned by either potash or lye should be kept from getting wet during three or four days following treatment so that the dissolved caustic will not run down and burn the skin. The calf will suffer some pain for an hour or two but no other inconvenience is experienced. Treated calves should be tied separately so that they cannot lick each other.

Horned cattle not treatetd while calves may be readily dehorned by either an ordinary meat saw or dehorning clippers. The pain of such operation has been overestimated and the mortality is practically nothing. The exact loss of flesh due to excitement, loss of blood and pain, is difficult to estimate, as very much depends upon the skill of the operator, and perhaps more still, upon the temperament of the animal operated upon, nervous; irritable animals, suffering a greater set back than quiet, sluggish ones. In any case the loss is seldom great. At the Central Experimental Farm no great difference was observable in the effect of the different instruments used in dehorning except that there was but very little blood lost where the saw was used.

It is not advisable to dehorn in very cold weather nor should it be done during fly time. March, April, October and November are favourable months.

To secure an animal for dehorning a strong post or stanchion is necessary or, if much of it has to be done, it is worth while to erect a dehorning chute. For a small herd it does very well to use a stall partition post to secure the animal. The victim should be backed into the stall and its head securely fastened to the post. A lead ring attached to the nose takes the animal's attention from the operation. In addition a rope should be put on in such a way as to form a noose over the nose to give control of the head. A dehorning chute is simply a strong stall built in the yard with the forward end so arranged that the stanchion may be closed tightly on the animal's neck close to the head. The head when thus fastened should be not more than 20 inches from the ground. A noose firmly held completes the fastening.

Either the saw or clippers may be used and there is little to choose between them. The saw as a rule makes the neater job, but, the clippers perform the work more rapidly. Occasionally clippers crush the bone causing a slow healing. Unless the horns are taken off very close they bleed badly and stubs grow. The cut should take about one-sixth of an inch of the skin around the base of the horn and should be slanted with the natural slope of the head. Some animals bleed severely. To prevent this wind a piece of strong twine firmly around the head just below the horn bases so as not to interfere with the operation. Then tighten the twine by drawing together the upper and lower strands mid-way between the horns and fasten with a knot. Twine put on in this manner presses firmly against the large arteries. In a few hours the twine may be removed when danger from bleeding will have passed. Dehorned animals should not be allowed to rub against hay or straw stacks until the wound has healed. An application of carbolized oil or pine tar and lard after bleeding ceases will hasten the healing.

An examination of cattle from day to day in large markets proves that many cattle are badly dehorned, allowing stubs to grow out from the head. In many cases the stub turns down curving in penetrating the skin, even to the extent of creating a festering sore. This condition is objectionable for two reasons—1st. in causing pain and therefore reducing the gains by the animals; 2nd, cattle having ingrown horns are rejected for export. Almost every week a number of animals in export shipments have to be withdrawn and disposed of locally. While a small proportion of cattle thus turned back have not been dehorned, the great majority of them have been subjected to the process of dehorning which has been imperfectly done. A horn that is not killed or removed below the base will grow out an abnormal stub and is liable to turn in toward the head causing damage. In dehorning, therefore, care should be exercised to do the job thoroughly.

ESTIMATING THE WEIGHT OF LIVE CATTLE.

Long experience in the cattle trade may enable a feeder or dealer to estimate an animal's weight fairly closely. At times, however, even the experienced are out when the scale is applied. The beginner, when the scales are not at hand, usually guesses either too high or too low. We have seen a 1,100 pound animal's weight variously estimated at from 850 to 1,250 pounds,—a wide difference of 400 pounds and that among farmers who had been raising cattle but usually selling per head in place of per hunderd weight. This is but one instance of the hundreds similar that have come under our notice in recent years.

Where the stockman does not have a scale the following table of weights based upon heart girth measurements will be found to give an approximately fair idea of an animals weight. The girth should be taken just back of the shoulder and forelegs at the place where the body is shallowest. This place may be found by drawing the tape back and forth a few times before tightening to take the measurements.

Heart Girth.		Store Cattle.		Fat Cattle.	
		Fair condition.	Good condition.	Fair condition.	Good condition.
Feet.	Inches.	Lbs.	Lbs.	Lbs.	Lbs.
5	0	650	700	700	750
5	1	675	725	725	775
5	2	700	750	750	800
5	3	725	775	775	825
5	4	750	800	800	850
5	5	775	825	825	875
5	6	800	850	850	900
5	7	825	875	875	925
5	8	850	900	900	950
5	9	875	925	925	975
5	10	900	950	950	1'000
5	11	925	975	975	1'025
6	0	950	1,000	1,000	1,050
6	1	1,000	1,050	1,050	1.100
6	2	1,050	1,100	1,100	1,150
6	3	1,100	1,150	1,150	1.200
6	4	1,150	1,200	1,200	1.250
6	5	1,200	1,250	1,250	1,300
6	6	1,250	1,300	1,300	1.350
6	7	1,300	1,350	1,350	1.400
6	8	1,350	1,400	1,400	1,450
6	9	1,400	1,450	1,450	1.500
6	10	1,450	1,500	1,500	1.550
6	11	1,500	1,550	1,550	1,600
7	0	1,550	1,600	1,600	1,650
7	1	1,600	1,650	1,650	1.700
7	2	1,650	1,700	1,700	1.750
7	3	1,700	1,750	1,750	1,800
7	4	1,750	1,800	1,800	1,850
7	5	1,800	1,850	1,850	1,900
7	6	1,850	1,900	1,900	1,950

FRESH BEEF FOR THE FARMER'S TABLE.

In country districts, except where farmers co-operate to supply themselves with fresh beef, the meat diet of the people as a rule consists of pork, especially during the summer months. In certain favoured sections through the agency of the local butcher more or less beef is used throughout the year. Too often, however, the available supply of beef thus secured is of inferior quality, being cut from the carcases of old cows or lean cattle unfit to ship to market. When only such beef is available it is used more as a change than as the regular meat portion of the diet. Pork being easily cured and stored has of necessity become the meat food of the people. During the winter season the farmer is able to provide his family with well finished beef fattened in his own barn. At that season the meat can be kept fresh in good condition until used. It is during the more trying weather of summer that fresh meat is especially desirable. The difficulty of securing it has in many districts been overcome by a co-operative system whereby a stated number club together and furnish the animals to be butchered and distributed to the members throughout the season. The associations, which are known by several designations, as 'Beef Syndicate'; 'Mutual Beef Association' and 'Beef Ring' have memberships of from 16 to 40 members and run from a few months in summer, in some cases, to the entire year in others. The most popular membership is twenty and the length of season twenty weeks. To describe the 20 memberships' society will suffice to illustrate the working of the smaller or larger organizations.

A twenty-member beef ring usually runs for twenty weeks, each member supplying one animal during the season. The animal should dress about 400 lbs. which divided gives each member 20 lbs. per week. The beef is cut up according to a chart and each member gets a steak, a roast and a boiling piece each week. It is distributed in such a way that each member will have received all the cuts of a carcass during the season. In this way absolute fairness is meted out to all. In the case of small households, two members together, take one share between them, and of course provide only one animal. Should a member require and receive more than one regular share per week the matter is adjusted at the end of the season according to the price per pound fixed by the society at the beginning of the season. The usual price has for a number of years been about seven to ten cents per pound.

In some districts the sixteen-member ring is most popular, as less cutting is required, and in the case of small families a share between two gives a sufficiency. It has the disadvantage of running for only sixteen weeks in a season, or it may run thirty-two weeks by each member putting in two animals. A small animal dressing 320 pounds is killed each week. Some of the 24-member rings adhere to the 400 lbs. carcass which gives each member a weekly portion of 17 lbs. A ring of this size runs for practically half the year, commencing about the middle of May. The season in some societies commences on May 1 and for the first two monthts a beast is killed every alternatet week, and every week thereafter.

Winter is the best season to organize a society. Having secured a sufficient number of applications for membership a meeting should be held when officers should be appointed and rules and regulations endorsed. Following is a copy of the constitution of a working 'Beef Ring' having a membership of twenty.

Constitution of Beef Ring.

I. This association shall be known as the......................Association, and shall consist of 20 members, whose object shall be to furnish each member with his portion of fresh beef weekly during the specified season.

II. That officers shall consist of a president, secretary and treasurer, whose duties shall be such as usually pertains to such offices; also, a managing committee of three members, whose duties shall be to provide a suitable place for slaughtering, settle all differences in regard to weight, and quality of animals furnished, and the general oversight of the work, and any vacancy occurring in any office shall be filled by a vote of a majority of members present at a meeting appointed by the society, as hereinafter provided.

III. The officers shall continue in office for the period of one year, unless otherwise determined by a majority of said society.

IV. The president and secretary shall be and are hereby empowered to convene all meetings considered necessary by them, and any special meeting at the request of any five members, given in writing.

V. Seven members shall constitute a quorum for the transaction of business.

VI. All persons becoming members of this society shall subscribe to the articles of this constitution, and will be governed thereby.

VII. The annual meeting shall be held at a place and on a day agreed upon, for the purpose of closing up the business of the current year, enrollment of members, election of officers, making arrangements for succeeding year's operations, and for the transaction of such other business as may be brought before the meeting, notice of which meeting shall be given each member by the secretary.

By-laws.

1. The society shall elect one of its members to the position of butcher (whose duties are hereinafter defined) who may engage some suitable person to perform said duties.

2. Each member shall furnish one heifer or steer, the age of which shall not exceed two years, and weighing about four hundred pounds, suitable for the purposes of the society during the season, in his proper turn, said season to consist of twenty weeks, commencing and ending at such times as may be determined at any regular meeting of the society.

3. The order in which each member shall furnish his animal shall be decided by lot at the annual meeting, or at a meeting held at least three months prior to the day of the first killing.

4. Each member shall deliver his animal at the place of slaughter at or before 9 o'clock on the day appointed by the society for the slaughtering of each animal.

5. Each member furnishing an animal shall be entitled to and receive the rough tallow, head and heart of the same.

6. The butcher shall be the judge of the suitableness of all animals furnished, and may reject unsuitable animals, subject, however, to an appeal to the managing committee.

7. The butcher shall weigh each carcass when dressed, and keep an account of the same giving proper credit to the member furnishing said carcass. He shall also cut and distribute weekly, to each member of the society, an equal portion of the same, as near as he can judge in the division, and keep strict account of the amount furnished each member per week, and at the end of each season settlements shall be made with the members of the society, in accordance with the accounts kept by the butcher and the price per pound agreed upon by the society.

8. The distribution of the butcher in accordance with the foregoing rules, shall be accomplished by placing each member's portion on hooks under their respective names at the place of slaughter, or at such other place as may be agreed upon by the society.

9. The butcher shall market all hides and pay over to the treasurer the money obtained by him for the same, and shall receive for his services the sum of two dollars per head for all the animals slaughtered, cut up and distributed by him.

10. The money obtained by the butcher for hides shall remain as a fund in the hands of the treasurer for the purpose of defraying the necessary expenses of the society, and settling the differences of accounts between members at the end of each season.

11. No member shall have the privilege of withdrawing from the society without the consent of the majority of said society, and in no case will a member be allowed to withdraw until his accounts are settled with the society.

12. The above articles and regulations governing this society shall remain in full force and virtue unless amended by a two-thirds vote, after a notice of such amendment has been regularly given.

The System of Division.

The carcass is divided according to a diagram. The accompanying chart Fig. 81 of one side shows a very satisfactory system of division. The other side or half is similarly divided. The following table shows a satisfactory combination of cuts for the different members:—

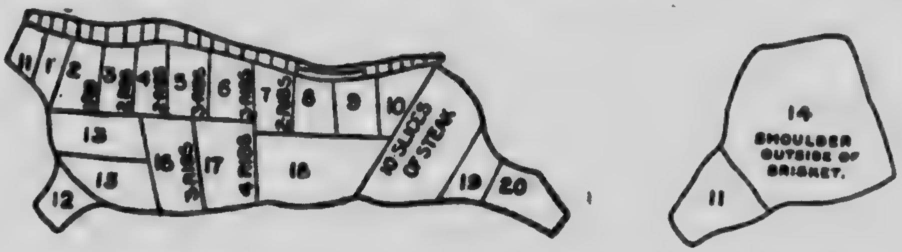


FIG. 81. DIAGRAM SHOWING DIVISION OF CARCASS FOR A TWENTY MEMBER BEEF RING.

Roast.	Boil.	Steak.
1	13	1
2	14	2
3	19	3
4	16	4
5	17	5
6	18	6
7	15	7
8	12	8
9	20	9
10	11	10

Method of Coupling Cuts.

The above table shows the three pieces received from one-half of the carcass by ten members the first week of the season. The other half is similarly divided amongst the remaining ten members. On the second week, member No. 1 drops to No. 2 position and No. 10 takes the place of No. 1. This system is followed during the season. As a rule each member provides himself with two or more cotton bags of good quality each bearing his name. The portions due each member are placed in his respective bag and hung on the hook under his name. Thursday is the usual day for killing and the members go for their meat on Friday morning. With a proper cold storage the meat can be held until the members deside to take it away.

COLD STORAGE FOR THE MEAT.

While freshly killed beef, especially when taken from the carcass of a young and well fattened animal is much superior to salt pork during the warm months of the year it may be further improved by what is termed 'maturing on the hocks.' Beef properly 'hung' is improved both in flavour and tenderness, but more particularly the latter. This to the man living most of the time out of doors is of perhaps little importance as his appetite and digestion are usually good, but to some of the other members of the family tenderness is of some moment. In any case it is very generally recognized that beef improves by hanging in cold storage. Many of the first-class hotels and restaurants adhere to the practice of using beef only after it has hung in a temperature of about 34 deg. F. from four to five weeks. At this low temperature no alteration in the nutritive value of the meat takes place during such a period except that it is rendered more palatable and tender and therefore more digestible and nourishing. As the temperature of the storage rises the maturing, or fermentation, becomes more active and the meat reaches its best condition correspondingly earlier. Beef hung in a storage at 40 degrees would reach an excellent condition for consumption in about ten days and it should be very good at the end of one week. This is about as cold as would be practicable in an ice cooled storage such as a beef ring could profitably provide.

The best method of cooling food products by means of ice is found in the use of one or other of the modern styles of refrigerator in which the ice does not come into immediate contact with the materials to be preserved but is separated from them by a division wall. The meat is thereby not cooled directly but indirectly by the surrounding air. In the refrigeration of meat it is important to have the atmosphere of the storage as dry as possible for the reason that decomposition is hastened by moisture. In high altitudes where the air is extremely dry and pure, beef may be hung out of doors where it will not decompose but dry out thoroughly. At the sea level where the air contains a large amount of humidity meat in the open will readily decompose. It therefore follows that the system of refrigeration to be used should be that which tends to keep the atmosphere dry.

A Small Cold Storage.

A cold storage for a beef ring should be large enough to accommodate at least two carcases at once. Should the members all see fit to allow the meat to hang only one week the extra space would render the room more easy to work in or perhaps to store butter or other products. When an ice house is filled each year a small portion of it may be partitioned off as a cold storage room. With the ice properly packed on three sides and with good drainage, this makes a fairly satisfactory plan for keeping meat although it is by no means equal to a properly constructed refrigerator on account of its dampness.

A refrigerator suitable for use on farms and small butcher shops is described by the Dairy and Cold Storage Commissioner in a recent report. See plan and section in Fgs. 82 and 83. The ice chamber is comparatively small and has to be frequently replenished. The refrigerator proper, including the anteroom, the cold room and the ice box require to be exceedingly well built in order to provide for good insulation. The ice storage need not be expensively built as the ice can be protected by such insulating material as dry straw or sawdust on the sides and over the top.

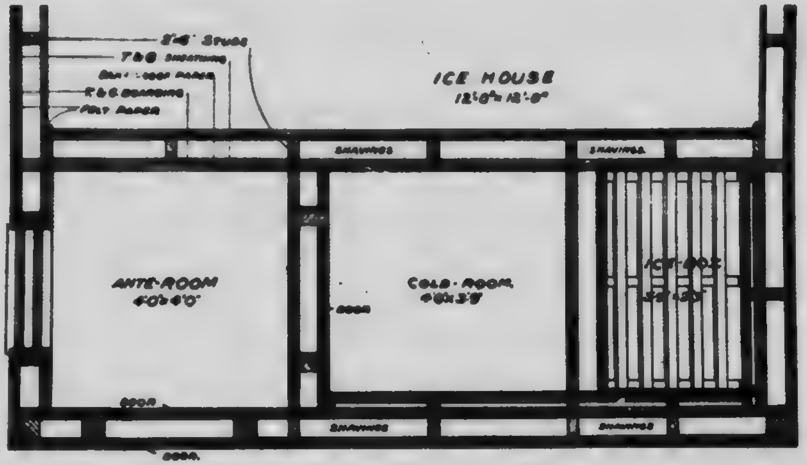


FIG. 82. GROUND PLAN OF COLD STORAGE.

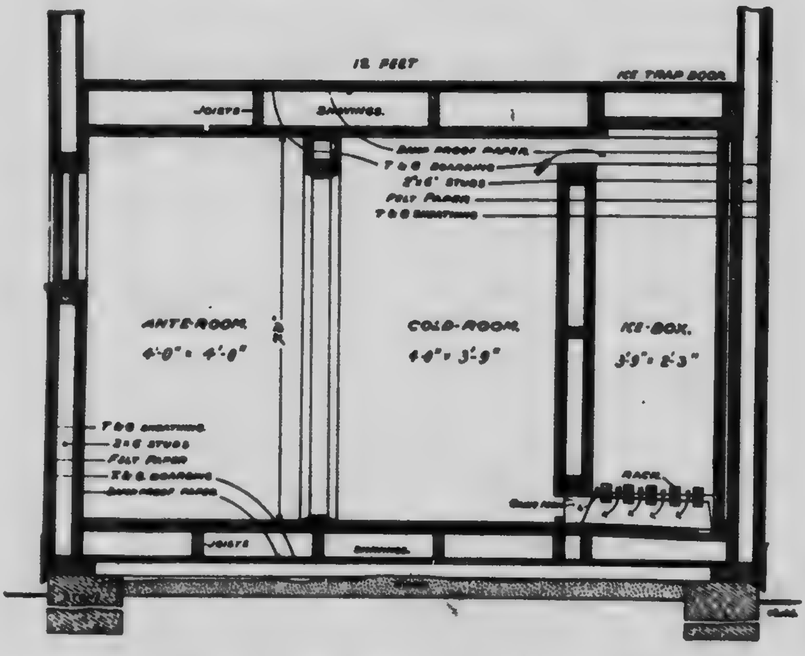


FIG. 83. CROSS SECTION OF COLD STORAGE.

The principle of refrigeration is based on the tendency of warm air to rise and of cold air to fall. This keeps up the circulation by which the air is constantly passing between the chunks of ice in the ice box. As the warm air reaches the ice from the cold room the moisture contained in it is condensed on the ice. This it will be understood keeps the atmosphere in the cold room not only cold but comparatively dry as well.

The size of the refrigerator needed depends upon the use to be made of it. The plans shown provide for a cold room 4 ft. by 3 ft. 9 inches and 7 ft. high. This would easily accommodate two carcases each divided into four quarters. If a larger room is required a correspondingly larger ice box should be provided.

The ante-room is an important part of a refrigerator. This like the cold room should be provided with close fitting hollow or double doors. The ante-room and cold room doors should never be open at once nor should either be left open longer than is absolutely necessary or ice will be wasted. The ante-room may be used for cutting up the meat. Hooks should be placed on the walls to receive the bags containing the shares of the members.

Construction.

All lumber, except clapboards, should be tongued and grooved, and spruce only should be used for the ice box, cold room and ante-room. No tar paper should be used, on account of its strong odour.

The building will be better, and more permanent if placed on a stone or concrete wall. Otherwise it must be well 'banked' to prevent circulation of air underneath.

The extra course of lumber under the siding, also the dead air space, may be dispensed with on the walls of the ice house, *but not on the other parts of the building.*

The partitions between the ice chamber and the other compartments, and also between the ice box and the cold room, need to be well insulated, as shown, to prevent dampness. A poorly insulated partition against an ice chamber will become cold on the surface and consequently collect moisture. Many refrigerators and cold storages are failures from this cause. Emphasis is laid on this point, because thin partitions are occasionally placed between the ice chambers and the cold rooms, on the theory that refrigeration secured in this direct way is all that is needed. Dryness in a refrigerator is just as important as low temperature.

No roof is shown in the plan. That is left to the fancy of the builder. The construction of the ceiling should be the same as the walls and the corners must be thoroughly close.

Sufficient room must be left above the small compartments to allow of the blocks of ice being transferred to the ice box through the ice trap door.

The window in the ante-room has double sash, each sash being double glazed, giving four thicknesses of glass. Shutters are needed to keep out direct sunshine.

The floor under the ice box should be covered with galvanized iron, sloping in the one direction, with a gutter at the lowest edge to carry off the water from the melting ice. The drain pipe from the gutter must be trapped to prevent the passage of air. A simple plan is to have the end of the pipe turned down and extending nearly to the bottom of a small dish or vessel of any kind, so that the water will rise above the end of the pipe before the dish overflows.

Planing mill shavings are highly recommended for filling the spaces between studding and joists as shown on plans. They are always dry and do not become musty. If they cannot be procured, sawdust is probably the next best thing, but it should be *thoroughly* dried before being used.

The spaces between the studding around the ice chamber should not be filled. Any filling will eventually become damp from the ice, and damp material of any kind has very little insulating value.

Management.

As there is no floor in the ice storage, the earth beneath it should be well drained. The surface should be covered with 6 to 8 inches of broken brick, coal cinders, tan bark or other similar material of a non-conducting character. If nothing better can be procured broken or cobble stone covered with a layer of gravel or sand will answer. This material will make a good permanent bed.

Before filling with ice, 8 inches of sawdust should be put over the permanent bed. This should be renewed each year. The ice should be packed as closely as possible, filling all spaces with crushed ice well rammed. A space of 12 inches should be left between the walls and the ice, to be filled with dry sawdust. The top of the ice should also be covered with 12 inches of dry sawdust. If sawdust cannot be procured, hay or straw either cut or long may be used, but the space filled should be 18 inches instead of 12, and the filling well packed.

To utilize the cold room, fill the ice box with cleaned ice in lumps as large as convenient to handle. The box shown on the plans will hold sufficient ice so that it need not be filled often. The openings at the top and bottom of the partition between the ice box and the cold room may be fitted with a slide to regulate the circulation of air.

Particular attention must be paid to keeping the doors perfectly air-tight. A cushion of thick felt for the door to close against is about the best thing to ensure a good joint.

It is necessary to keep the refrigerator as sweet and clean as possible. It is advisable to use a liberal amount of sawdust on the floors so that drippings from the meat may be readily absorbed. The sawdust should be changed, at least those portions of it that have absorbed drippings, at least once a week. Care should be taken to keep doorways through which the carcases pass cleanly washed.

Killing and Cooling Beef.

Animals to be killed should be deprived of food from 12 to 20 hours during which time they should receive all the water they desire. They should be delivered at the slaughter house at least 12 hours before being slaughtered. The killing should be done in the evening and the carcass divided into halves or quarters and hung in an open shed or under a tree over night. A carcass so hung will lose the animal heat, that is to say, the temperature of the carcass will by morning have reached the temperature of the atmosphere. Early in the morning it should be placed in the refrigerator where it should remain until cut up and distributed.

THE FUTURE OF THE INDUSTRY.

It is not only the optimist that predicts a bright future for the Canadian beef raiser. It is generally believed that years of low values have passed and that the cattle raiser who will give attention to the matter of producing bullocks of good quality need have no misgivings in regard to the demand for them.

The development and improvement of transportation and marketing facilities are bringing about a uniformity of values the world over. The countries, that, by reason of the nature of their industries, have to import beef, in a large measure decide the price. In such countries competitors from the ends of the earth meet and accept for their goods values governed by the law of supply and demand.

The reported shortage of cattle and marketable beef that has been evident during the past year has led certain meat trade journals to make the statement that the world is eating up its stock and that sooner or later a meat famine is inevitable. While such prognostications need not be taken seriously it is worthy of note that beef eating populations are at the present time increasing more rapidly than beef cattle. In the whole of Europe, including Great Britain, there were in 1878, 101,000,000 head of cattle, and these by 1908 had increased to 120,000,000. In the British Empire, outside of the British Isles, and therefore including Canada, India and Australia, the numbers went up during the 30 years from 13,000,000 to 23,000,000. Of the remainder of the countries of the world that to any extent carry on cattle raising there remain only the United States and certain South American countries. During the thirty years in question the cattle of the American Republic increased from 46,000,000 to 71,000,000, and of the Argentine from 22,000,000 to 29,000,000. The combined figures representing the number of cattle in these several countries, which include practically the whole of the beef trade, would show an increase from 190,000,000 to 259,000,000 in the thirty years. While these figures do not appear to indicate an early beef famine it is nevertheless true that the beef consuming population of the world has increased at a much more rapid rate. It is this relative rate of increase that concerns the cattle raiser, and this is most clearly demonstrated in the export movement of beef by the foremost cattle countries.

So far as Canada is concerned, Great Britain may be looked upon as the world's market, and her competitors in that market are the United States and the Argentine. From these three comparatively new, fertile, and extensive countries Great Britain has largely secured her fresh, unfrozen beef that could not be supplied at home.

Exports to Great Britain.

A careful study of statistics shows that the export trade in beef to Great Britain is rapidly shifting from North to South America, and if present conditions continue it will not be long before the United States will cease to be a competitor with Canada and the Argentine in the British market. The following tables show the numbers of live cattle and quantities of chilled beef exported by Canada, the United States and the Argentine each year since 1905:—

IMPORTS of Live Cattle into the United Kingdom from Canada, the United States and the Argentine.

Year.	Canada.		United States.		Argentine.	
	No.	Value.	No.	Value.	No.	Value.
		$		$		$
1895	85,863	6,797,615	284,258	26,627,461	39,436	2,982,449
1896	97,042	6,816,361	385,350	35,932,727	65,699	4,495,038
1897	120,063	6,454,313	396,371	37,052,990	73,852	5,613,734
1898	122,106	7,403,990	342,689	31,668,909	89,369	6,576,926
1899	115,476	7,129,430	303,539	27,737,770	85,365	6,777,083
1900	115,056	7,579,080	423,181	33,819,164	38,562	3,248,389
1901	119,050	8,028,476	454,590	36,606,204	None	None
1902	148,927	9,742,738	327,118	24,301,969	"	"
1903	161.170	10,842,438	519,963	37,725,452	27,817	2,217,523
1904	148,301	10,046,651	599,180	41,415,729	None	None
1905	159,078	11,047,167	571,153	41,007,375	"	"
1906	163,994	11,045,463	494,366	38,273,132	"	"
*1907	149,340	10,200,137	401,583	33,796.425	"	"
1908	124,015	8,584,806	277,036	24,034,193	"	"
1909	143,661	10,115,793	184,957	16,274,250	"	"

* 9 months.

CHILLED BEEF Imported into the United Kingdom from North America and Argentine.

Year.	North America.	Argentine.
	Quarters.	Quarters.
1895	990,000	....
1896	1,245,000	....
1897	1,345,000	....
1898	1,381,000	....
1899	1,654,000	....
1900	1,720,000	....
1901	1,909.000	24,919
1902	1,374,000	94,498
1903	1,616,000	142,542
1904	1,438,000	198,200
1905	1,339,000	402,195
1906	1,456,000	454,613
1907	1,451,000	427,042
1908	859,000	767.284
1909	521,000	1,066,134

As will be noticed the chief feature of the above tables is the rapid shrinkage of exports by the United States. Not only have the exports of live cattle reduced in volume, but the quality during the past year has not been up to the standard of earlier seasons. The change in this particular was especially marked during 1909 when the cattle sent were of the coarser and commoner grades. The reason for this was that prices in the home market were higher than in the British market for the best class of stock. The volume of exports of dressed meat from the United States has declined even more rapidly than live cattle. All this is due to the increasing population, expanding industrial activity at home and the decline in cattle population.

Whether or not the improved values will greatly increase the beef stocks of the United States is a question yet to be decided. Those in a position to judge of the future look for the home demand to quite overtake the supply within a few years. Packing house magnates, who have established retail shops in Great Britain and have supplied them from their own abattoirs, appear to see the handwriting on the wall, and already have established plants in the midst of new sources of supply. At Edmonton, Hamilton and Winnipeg, Chicago firms have in operation large packing houses, and at Toronto, the Union Stock Yards have been taken over by a Chicago firm. At the latter point buyers representing some half dozen large United States firms are on hand from week to week to bid for the offerings of export cattle. During the summer months of 1909 through the agency of these buyers more export cattle were shipped from Toronto than from any other point in America, Chicago following next in order for this period.

It is in South America that Chicago firms are extending their business most rapidly. Two of the strongest corporations already have in operation in the Argentine extensive chilling and freezing plants, and are expanding their operations so rapidly as to give currency to the opinion that they are on a fair way to acquire controlling power of Argentine meat supplies.

That the Argentine Republic occupies a favourable position in regard to its future beef production is already demonstrated. Its immense areas of rich, grazing and farming lands, well adapted to the growing of the finest of cattle foods, including alfalfa and corn; its large herds of breeding stock, graded up with the blood of the best British Shorthorn and Hereford families; its temperate climate, rendering the housing of growing and fattening stock unnecessary; and, withal, its enterprising and wealthy stock owners make a combination not possessed by any other country.

As shown by the above table upon exports of live cattle, the Argentine made a creditable beginning in sending cattle to the British market, which trade was stopped short because of disease in Argentine herds. No sooner had this been accomplished than they commenced to ship fresh beef in chilled condition, and to-day they have steamship facilities by which chilled beef is delivered in Great Britain in merchantable condition. The table on chilled beef shows how that country overtook in 1908, and surpassed in 1909, the exports of this product from North America, which means the United States. Indications are that the Argentine Republic, on account of its country, stock and facilities, will very soon dominate the chilled beef supply of Great Britain. With the termination of exports from the United States the demand upon the Argentine will so increase as to quickly show itself in improved values, which will assure the continuation of good prices for beef cattle, not only in the Argentine, but also in competing countries including Canada.

A phase of the question which should not be overlooked is the uncertainty of the supply from South America. As is well known the Argentine is subject to severe droughts, but, against this, must be set the adaptability of much of the country to irrigation. Then the Republic of Uruguay is looming up as a cattle country. It possesses fine grazing lands and much attention is now being given to the improvement of its cattle, of which it has some five million head which are not run in large bands, as in the Argentine, but in smaller herds, as in Canada. This country has already entered the list of those exporting beef and may yet assume an important position in this regard.

The Situation in Canada.

Canadian beef cattle raisers have not been more wise than their neighbours to the south in the matter of keeping up their breeding herds. Both in Canada and the United States during the years 1908 and 1909, when industrial advancement and increase of population were unusually marked, the beef cattle stock has been allowed to fall even behind that of previous years. Figures representing cattle, other than milch cows on United States farms, show a decrease of almost a million head from January 1, 1908, to January 1, 1909, and by the end of 1909 the numbers had fallen off more than 2,000,000 additional head. The actual figures are:—

January 1, 1908	50,073,000
January 1, 1909	49,379,000
January 1, 1910	47,279,000
Decrease in two years	2,794,000 head.

In Canada the situation is little, if any, more favourable in regard to numbers of cattle other than milch cows. Following are the figures for 1901, and for each of the past four years:—

1901	3,167,774
1907	4,394,354
1908	4,629,836
1909	4,384,779
1910	4,033,280

The figures shown in the first four years were the numbers in June, those for 1910 for January 1. They show a normal increase up to 1908, then a decrease of 245,047 up to June 1909, and of 351,499 during the following six months, or a decrease of nearly 600,000 cattle, other than milch cows, in the eighteen months ending with 1909. This is undoubtedly the most unfavourable feature of the beef cattle situation, for just at the time of high prices due to shortage in other countries, the Canadian farmer finds his marketable stock lower than it has been for years. Nor does the immediate future seem bright with hope except for those who have been wise enough to keep up their herds. The high prices have taken from the farms many females that should have been retained for breeding, thus seriously reducing the future supply of cattle. Farmers of the western provinces have been the greatest sinners in this respect. Out of nearly 70,000 head exported from the west in 1909 fully 65 per cent were females, while about 70 per cent of the 80,000 to 90,000 killed for local consumption were also cows and heifers. In addition a much greater number of calves than usual were slaughtered in the west during the year. In the east, more especially the province of Ontario, the situation as regards numbers is even worse. Exports have kept up fairly well but largely at the expense of the future. Cows and heifers have gone out in large numbers and many a stable that usually holds steers fed out heifers during the winter of 1909-10 because steers were not available. Where the supplies for the next five years are to come from is difficult to see. No doubt the province of Alberta will get back into cattle fairly rapidly. The tens of thousands of acres of ranch lands that produced from 70,000 to 80,000 head annually a few years ago will, as farming land in the near future, yield two, three or more times as many cattle. What length of time will transpire before the wheat growers of Saskatchewan and Manitoba will do their share in this regard? Manitoba alone has dropped off 100,000 head during the past two years. Unless these provinces stock up there will be no beef to ship east, and unless the east greatly increases its cattle Canada will soon follow the United States in ceasing to send beef to Great Britain. Great Britain needs a very large continuous supply of imported beef and prefers freshly killed to that which comes in either chilled or frozen. The United States will soon discontinue exporting live cattle and unless the British government again admits live Argentine cattle, Canada will have the field to herself. Whether or not she will get it depends upon the Canadian cattle raiser. At no time has his outlook been so bright as now. He will act wisely if he prepares for it by conserving his female stock to the utmost, producing from them by the use of the best males he can procure, and then, by proper feeding, hasten the male offspring to finished beeves in accordance with the teachings of the foregoing pages.